



OFR
**ANNUAL
REPORT
TO CONGRESS**
2020

FROM THE DIRECTOR



This year brought a financial environment of rapid and periodically unpredictable change. Unlike previous Annual Reports from the Office of Financial Research (OFR), this year's report is unique in that it was written in the wake of a material threat to financial stability.

Economic indicators on the eve of the global pandemic showed little if any concern about a slowdown, let alone a sharp but short economic contraction. For example, the U.S. civilian unemployment rate for February 2020 dropped to a 50-year low of 3.5 percent. It then spiked to 14.7 percent just two months later.

Over the turbulent months since the start of the COVID-19 pandemic, our Office's mission has never been more clear or important. As COVID-19-related disruptions evolve, our Office's data and research products will continue to provide timely indicators of financial stress for the Financial Stability Oversight Council (FSOC) and its members.

Following my confirmation in 2019, OFR prioritized an all-staff effort to dutifully fulfill our Dodd-Frank Act responsibilities. While our mission is simple, it

is essential — that is, to further financial stability through the analysis of informative financial data, as well as the advancement of data standards and products, principally in support of FSOC and its members. Indeed, throughout the turbulent months that began in February of this year, the value that our Office has provided to FSOC and its members has increased and deepened considerably from already consequential levels.

Reviewing my first full year as Director, I am proud of the important work that members of our staff have accomplished, and confident that our path forward will continue to find OFR leading the development of advanced research insights and data services.

OFR monitors and analyzes both potential and realized stressors in financial markets and institutions, with the objective of clarifying the cause and extent of any associated vulnerabilities. Our Office plays a complementary role in supporting financial stability, which is always important, and especially so during the natural disaster triggered by COVID-19.

Throughout the serious difficulties that COVID-19 brought to our health, economic, and financial sectors, our Office continued to build on its important work. For example, over a decade ago, the Dodd-Frank Act established a legislative mandate for OFR to build a Financial Instrument Reference Database (FIRD), but that mandate lay dormant until

now. This year, our Office made significant progress toward making this mandate a reality.

Our team continues to make valuable contributions as members of FSOC's Systemic Risk and Data Committees, while continuing to collaborate with individual member offices throughout. OFR's Data Center began releasing cleared repo data and launched our Office's Short-term Funding Monitor — an interactive tool that reliably delivers a more complete view of short-term funding markets. And furthermore, our Office added important enhancements to our Bank Systemic Risk Monitor, which tracks systemic risks that interconnections among the largest banks can create.

In addition, our Office's international leadership within the Legal Entity Identifier (LEI) continues to further the adoption and integrity of data standards that bring greater transparency and efficiency to financial markets worldwide.

Contributions to our annual report have come from every part of our Office. I am proud of this good work and whole-team effort, and even more so during the fallout from a global pandemic and sharp but short economic recession.

I am grateful for the integrity that our staff members bring to our Office each and every day. Without it, we cannot do our best work. With it, we will

continually strengthen our Office's support of FSOC and its members by building on our Office's organizational excellence, and furthering our culture of accountability and professionalism at every level.

Finally, let's always remember why we engage this mission — because when and where financial stability is compromised, economic opportunities go missing throughout our society. And the impact can be especially acute for low- and moderate-income households that may have trouble weathering emergencies, lack opportunities for economic mobility, or face high hurdles to improve life chances for children. As we turn to further recovery, OFR will continue to fulfill its mission by strengthening financial stability, and ultimately economic opportunity.

A handwritten signature in black ink, appearing to read "Dino". The signature is fluid and cursive, with a large initial "D" and a trailing flourish.

Dino Falaschetti
Director, Office of Financial Research

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SUMMARY: OFR 2020 ANNUAL REPORT TO CONGRESS

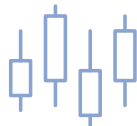
SUMMARY: OFR 2020 ANNUAL REPORT TO CONGRESS

With this report, the Office of Financial Research (OFR) presents its assessment of the state of the U.S. financial system, as required by the Dodd-Frank Wall Street Reform and Consumer Protection Act of 2010 (Dodd-Frank Act). The 2020 Annual Report to Congress fulfills OFR's requirement to submit a report to Congress within 120 days of the close of the fiscal year (FY). All data cited in this report are as of Sept. 30, 2020, unless otherwise noted.

This report also reflects the OFR's duty to inform policymakers, regulators, market participants, and the American public about its work to monitor, investigate, and report on changes in systemwide financial stability risk levels and patterns. The OFR's efforts support sound risk management for the entire financial system. For FY 2020, the report is organized into four main parts:



1 Assessing Financial Risks in a Turbulent Year



2 Assessing Financial Risks and Uncertainty



3 Exploration of Information Markets



4 The OFR's Performance



1 Assessing Financial Risks in a Turbulent Year

It has been a decade since the OFR was established and this report is presented during a time of financial and economic uncertainty that is a first for the Office. The OFR's data, research, and monitoring expertise was well-utilized this year and played an important role in identifying and understanding how stresses within the U.S. financial system during March 2020 interacted with vulnerabilities identified in previous years. Government financial system interventions developed during the 2007-09 financial crisis proved instrumental in moderating the effects of this year's financial turbulence.

The cause of this year's financial instability is novel. Within months of the new year, it became clear that the COVID-19 pandemic would be global and trigger devastating health,

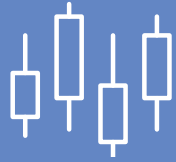
economic, and financial effects. During March, the medical crisis prompted U.S. state and local government decisions to declare stay-at-home orders and order the shutdown of many businesses. The pandemic and efforts to contain the health threat drastically curtailed economic activity and severely stressed financial markets. On March 9, 12, and 16, the Dow Jones Industrial Average, for example, experienced some of the worst price downturns in its history.

The economy, and even more financial markets, quickly made substantial recoveries with the help of massive government support. The Federal Reserve's balance sheet ballooned to \$7 trillion, by far an all-time high and almost double its size from a year earlier, while federal debt held by the public rose to an estimated 99 percent



of gross domestic product at the end of FY 2020 from 79 percent at the end of FY 2019.

As this report goes to press, America's economy has climbed rapidly back from the short but steep COVID-19 recession. And while our economy retraces its way back to trends that characterized the pre-pandemic economy, it will contend with heightened uncertainty and heterogeneous effects across sectors and firms within sectors. Extraordinary government and monetary policy support has gone far to moderate damage to our economy. But while that support helped bridge a period of heightened economic turbulence, it could also risk distortions to competitive markets if maintained too long.



2 Assessing Financial Risks and Uncertainty

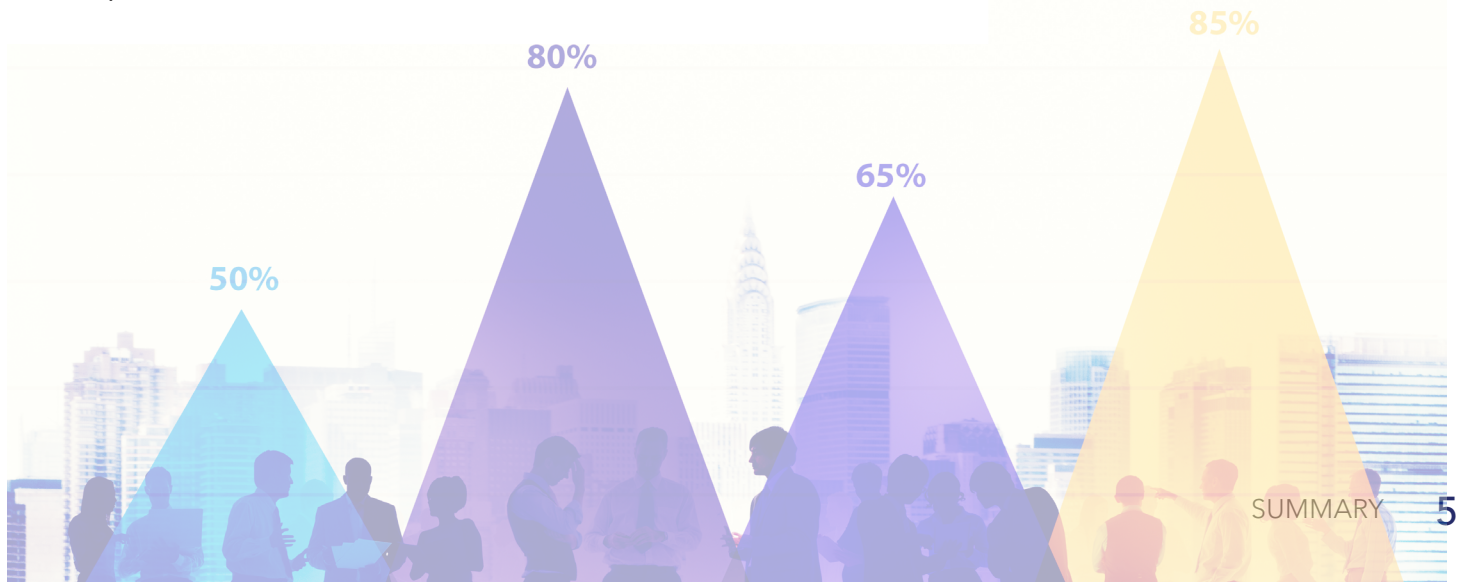
The OFR's financial stability assessment, combined with key findings from its financial system surveillance, evaluations of system vulnerabilities, data analysis, and research, supports its view that potential risks persist and remain elevated in most of the categories OFR monitors. These areas of risk include macroeconomic, credit, market, liquidity and funding, leverage, insolvency and potential contagion, cybersecurity, and additional risks not included in the other categories. The COVID-19 pandemic increased most, if not all, of these risks.

Despite government actions to stabilize the economy, as well as the finances of firms and households, macroeconomic and credit risks remain high. The pandemic's course remains uncertain, and thus, so must the economic recovery. Leverage is high among nonfinancial firms, with the potential for severe defaults within the commercial real estate, energy, and high-touch service sectors.

Liquidity and funding risks moderated quickly after the Federal Reserve's mid-March intervention announcements, while a midyear return to elevated

risky-asset valuations heightened market risk. Leverage within the financial sector rose modestly while remaining constrained since the 2007-09 crisis. Insolvency and contagion risks for financial firms appear to be contained while these firms maintain high capital and liquidity buffers.

Cyber risks have continued to grow in volume and sophistication. New vulnerabilities could emerge from increased reliance on remote work, as well as automated systems that strain financial firms' telecommunications capacity or that operate outside these firms' control. Natural disasters, the United Kingdom's exit from the European Union, and the transition from LIBOR to alternative reference rates for financial instruments, also remain potential sources of risk to financial stability.



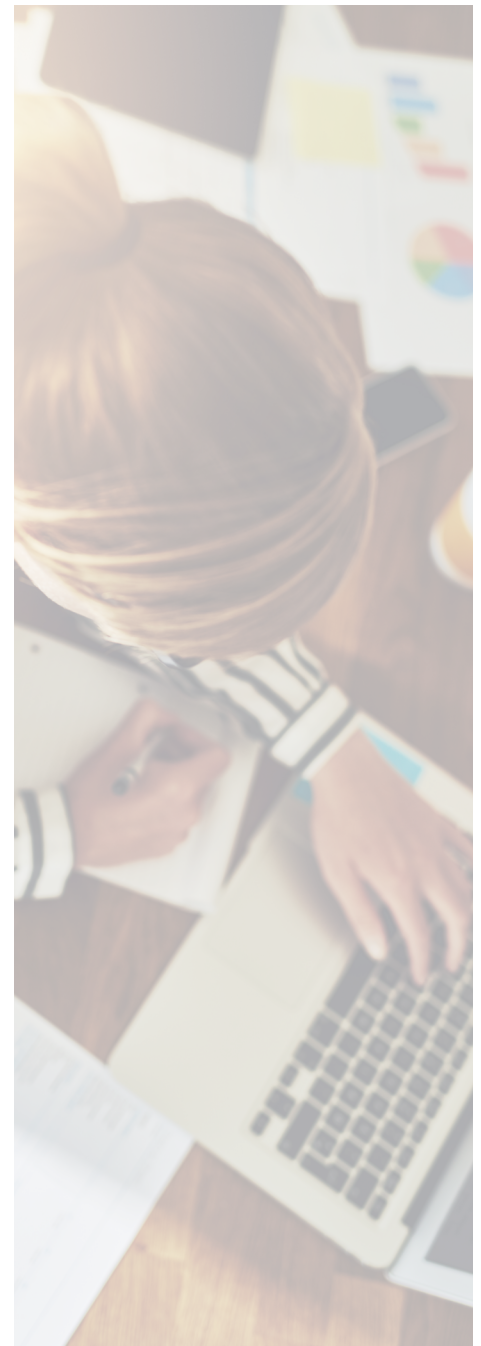


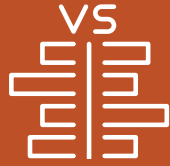
3 Exploration of Information Markets

Traditional approaches to managing systemic risks rely to a considerable extent on regulation, capital requirements, and oversight. People who are charged with enacting these strategies, however, can face political forces that favor distributional preferences over more general opportunity. In addition, they may work at a considerable distance from local knowledge that can help gauge reliance of financiers on each other for funding, the concentration of asset holdings across financiers, and the likelihood that adverse news about one financier's solvency can encourage runs on another's liabilities. Top-down approaches to managing systemic risk may thus face tight and hard-to-

move constraints against efficiently reducing the possibility, and mitigating the severity, of threats to financial stability.

A market for information about prospects for realizing systemic risks could weaken the incentive for creditors to run on financial organizations. Information markets might also be structured to better evaluate whether proposed or enacted policies and regulations can reduce systemic risks in a cost-effective manner. Finally, this latter type of market could increase transparency about winners and losers from such policies and regulations, and thus help more productive regulations overcome distributional inefficiencies.





4 The OFR's Performance

OFR promotes financial stability by delivering high-quality financial data, standards, and analysis principally to support the Financial Stability Oversight Council (FSOC) and its members. This year the OFR published its FY2020-2024 Strategic Plan, which consists of two goals: 1) Support the Financial Stability Work of the FSOC and 2) Further Organizational Excellence. The plan is designed to accommodate the changing needs of the OFR's stakeholders as they address financial vulnerabilities, stress, and even crises, as well as evolving financial business models.

Our performance measures and indicators provided a solid picture of OFR's progress toward objectives, goals, and mission achievement this year. Highlights include

international leadership in cross-border financial data standards and the innovation of several essential data products and initiatives. In 2020, the Legal Entity Identifier (LEI) reached its goal of global preeminence as a high-quality identifier for financial firms. The OFR served on the LEI's Regulatory Oversight Committee (ROC), which continued to focus on the quality of data that underlies the LEI. This past year, the ROC took on the role of governance for a trio of new financial data standards: the Unique Transaction Identifier (UTI), the Unique Product Identifier (UPI), and the Critical Data Elements for over-the-counter derivatives reporting (CDE).

The OFR's ability to equip the FSOC and its members with germane data collections, financial stability monitoring

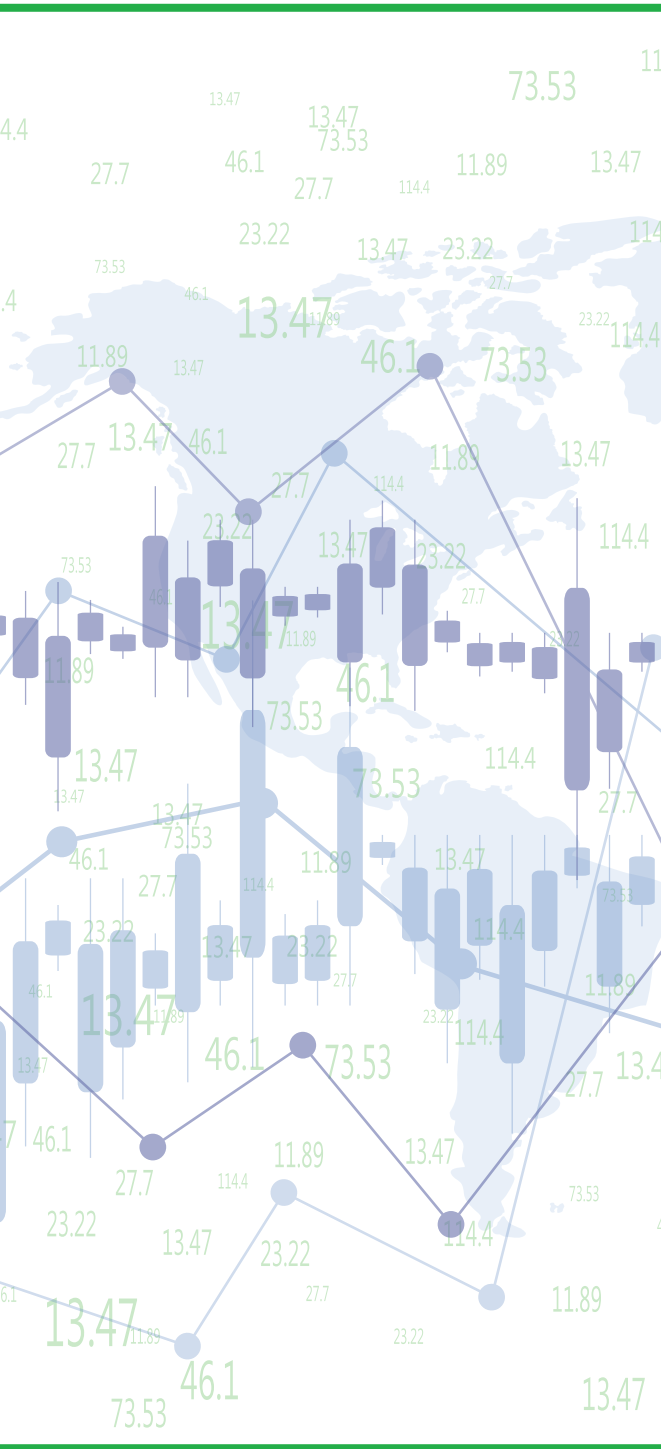
services, research insights, and analysis helped address the turbulence of 2020. Among the Office's online public monitors, the Financial Stress Index (FSI) provided, and continues to produce, daily indicators of financial system stress.

The Office also expanded its monitor offerings in 2020. The U.S. Repo Markets Data Release and the Short-term Funding Monitor were launched during the fourth quarter. Together, they provide new insights into short-term funding, the core of liquidity and maturity transformation in financial markets. Also this year, the Bank Systemic Risk Monitor (BSRM) was upgraded and the Financial Instrument Reference Database (FIRD) entered its initial phase of development.

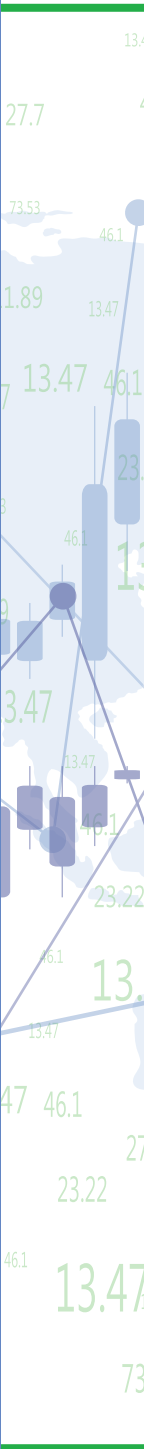
Years of migrating our Office's information technology to the cloud, and furthering significant system advances, proved prescient in preparation for the pandemic. Throughout this period, employee engagement and productivity were exceptional, as our Office continued to advance operational excellence and superior teamwork.

The OFR obligated \$62.69 million in FY 2020 — 42 percent for labor and 58 percent for other expenses. A large portion of the nonlabor figure was due to significant OFR expenses, particularly in the Technology Center (\$23.4 million), which support the OFR’s unique mandates. Office staff totaled 107 as of Sept. 30, 2020.





PART ONE: ASSESSING FINANCIAL RISKS IN A TURBULENT YEAR



PART ONE: ASSESSING FINANCIAL RISKS IN A TURBULENT YEAR

COVID-19 AND THE FINANCIAL CRISIS OF 2020

This year's Annual Report marks the first time the Office of Financial Research has published its financial stability assessment during a year when financial markets encountered extreme turbulence. We thus begin Part 1 of our report by reviewing the financial stress so vividly experienced this spring.

March of this year saw U.S. financial markets experience sharp and sudden disruptions, as well as falling asset prices. COVID-19, the disease caused by a novel coronavirus, stalled an economy that was hitting on all cylinders just a month before, and ended an expansion that had lasted more than 10 years. A series of extraordinary monetary and fiscal interventions allowed financial markets

to return to more normal functioning. Such government interventions can serve as a safety net in the near term, but they should not impede a return to competitively priced market rewards and losses. Indeed, as long as government intervention is necessary to keep the financial system functional, our economy cannot fully return to normal. As of the date of this report, many of these interventions had ended or were being unwound.

This threat to stability in 2020 had an origin different from the financial crisis of 2007-09, the international debt crises of the 1990s, the mortgage and sovereign debt crises of the 1980s, the oil crises of the 1970s, the economic collapse of the 1930s, the panic of 1907, or various 19th century panics. This time, the trigger was exogenous to the financial system — a new, virulent

virus that rapidly became a global pandemic, resulting in growing infections; deaths; great public fear; and disruptions to families, businesses, and lives worldwide.

In response came aggressive and unprecedented government actions to combat the pandemic. The pandemic itself, combined with these actions, had severe short-term economic costs, including a steep recession. More than 50 million people lost their jobs, many companies filed for bankruptcy or restructured their operations, and many sectors experienced sharp declines. Financial markets, anticipating the economic effects and faced with massive uncertainty, experienced considerable turbulence in March. The 2020 threat to stability started with the COVID-19 crisis, which brought material knock-on effects to

our economy and financial sector.

This latest threat to stability and its ongoing effects forcefully underline the lesson that efforts to assess financial stability always confront an economic and financial future marked by fundamental uncertainty and thus subject to sharp surprises. In particular, a risk assessment done now must likewise reflect substantial continuing uncertainties.

In 2019, about 30 central banks, multilateral organizations, and government agencies around the world issued official financial stability reports, including the OFR. Applying substantial expertise and knowledge, these reports attempted to size up and anticipate systemic risk. Displaying the difficulty of these efforts, most assessed risks as “moderate.” Not one of these reports predicted a financial crisis in 2020, or a significant probability of one. Not one highlighted the potential for a new pandemic to threaten financial stability. Although the possibility, even the high probability in time, of the emergence of new viruses and pandemics was well known (see *Mitigating the*

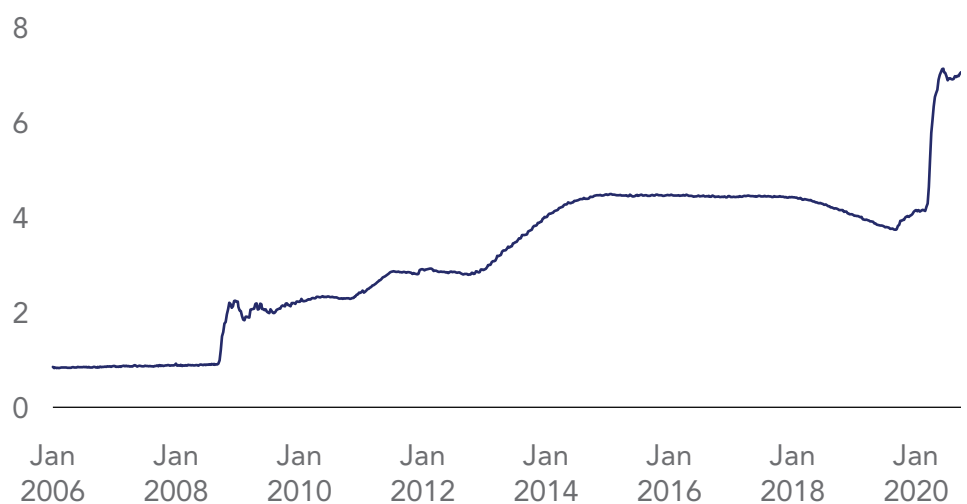
Economic and Health Risks of Pandemics), none of the financial stability reports linked that knowledge to the possibility of financial instability and a new financial crisis.

These reports discussed numerous relevant vulnerabilities — notably, increases in asset prices and leverage, partially because of long periods of very low, even negative, interest rates. U.S. reports correctly pointed out the risks of debt securitization, particularly for nonbank mortgage servicers and collateralized loan obligations (CLOs). However, none could or did anticipate, for example, that Congress would mandate forbearance on millions

of mortgage loans, that the travel industry would collapse, or many other 2020 surprises. The financial travails of the State of Illinois were well known, but no one imagined it would be borrowing more than \$1 billion from the Federal Reserve. And no one, including the Federal Reserve itself, forecast a Federal Reserve balance sheet that would expand to \$7 trillion (see **Figure 1**).

This record shows the difference between correctly perceiving vulnerabilities and correctly predicting a crisis and the extent of a crisis. Financial systems with only moderate perceived risks were hit by the unexpected shocks of

Figure 1. Federal Reserve Balance Sheet Reached Unprecedented Size in 2020 (\$ trillions)



Note: Total Federal Reserve System assets from Release H.4.1.

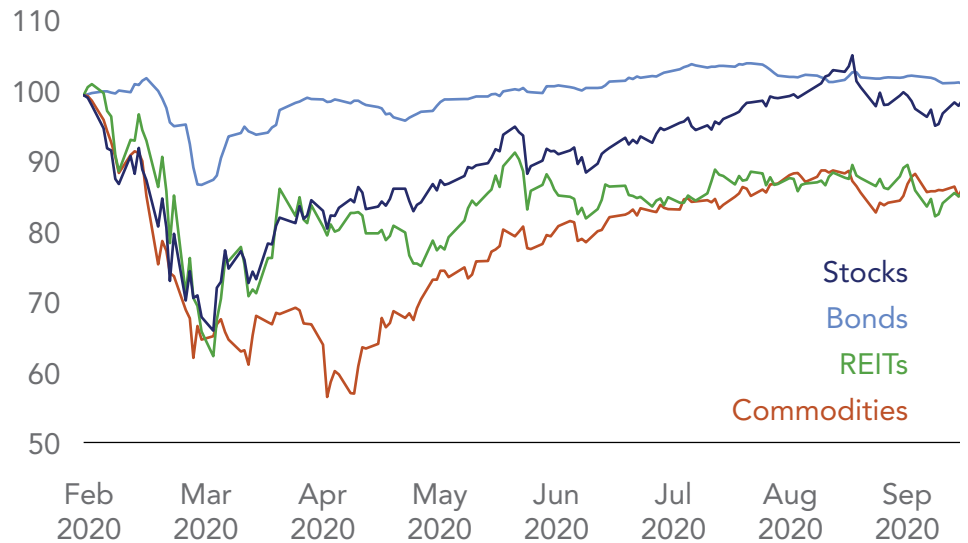
Sources: Board of Governors of the Federal Reserve System, Federal Reserve Bank of St. Louis, Office of Financial Research

the global pandemic and governments' responses to control it, with severe and unexpected financial reactions.

This year's disruptions reconfirm that no financial system, however structured, can avoid instability when large numbers of financial actors all try to move into cash at once — any more than banks, as is universally observed, can survive intact a run on their liabilities.

The “dash to cash” in March took place with breathtaking speed. Asset sales and redemptions of funds by investors were accompanied by unusually high market volatility and reduced lending by financial institutions. High market volatility, in turn, resulted in margin calls that contributed to a sell-off of even Treasury securities to raise cash. Prices of riskier assets fell sharply, with no asset class left untouched (see **Figure 2**). Treasury and repurchase agreement (repo) markets were distorted by the global need for cash. Bank lines of credit were heavily drawn down to raise cash. Some borrowers accessed credit lines strategically as defensive draws. Scarce liquidity was reflected in interbank spreads (see

Figure 2. Asset Prices Plunged, But Recovered (indexes)



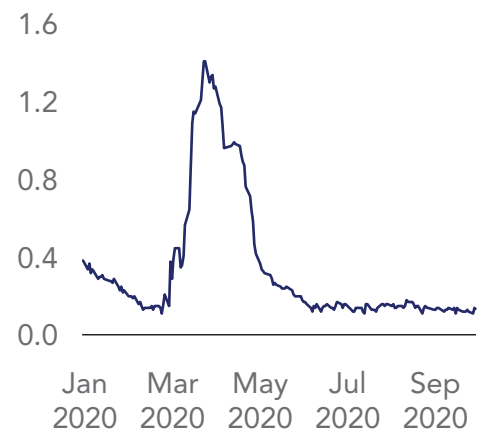
Note: Index values set to 100 on Feb. 19, 2020. Stocks are S&P 500 Index, bonds are Dow Jones Corporate Bond Index, real estate investment trusts (REITs) are S&P 500 Real Estate Investment Trust Index, and commodities are S&P GSCI Index.

Sources: Dow Jones Corporation, Standard & Poors, Haver Analytics, Office of Financial Research

Figure 3). The spike in unemployment and plunge in economic activity that quickly followed brought sharp declines in the prices of commodities, including further declines in the price of oil. All financial actors faced extreme uncertainty. In short, 2020 brought entirely unexpected financial turbulence and ongoing economic and financial risks.

The Federal Reserve, Administration, and Congress responded by providing vast market and economic support. This support addressed both the lack of market liquidity and the need for financing

Figure 3. Spike in TED Spread Marked Liquidity Crisis (percent)



Note: The TED spread is the difference between the three-month U.S. dollar LIBOR and Treasury bill rates. It is an indicator of liquidity in the interbank market, where large international banks lend money among themselves.

Sources: Federal Reserve Bank of St. Louis, Office of Financial Research

MITIGATING THE ECONOMIC AND HEALTH RISKS OF PANDEMICS

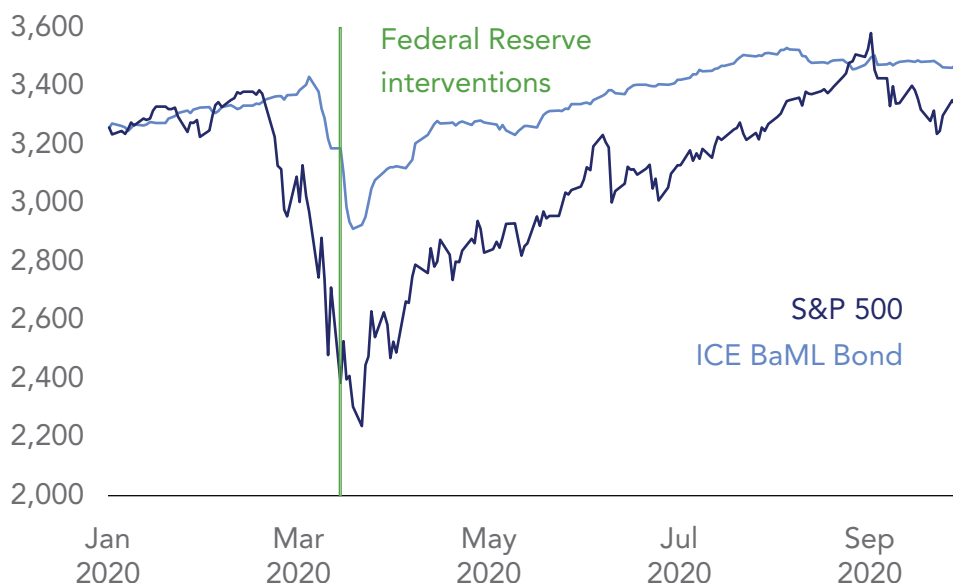
There were four influenza pandemics over the 100 years ending 2019, which translates to a 4 percent per year probability of pandemic influenza. The Council of Economic Advisers (CEA) reported in September 2019 that future influenza pandemics, depending on the transmission efficiency and virulence of the virus, could cause economic damage ranging from \$413 billion to \$3.79 trillion over the course of a year.¹ Large-scale, immediate immunization is the most effective way to control the spread of influenza, but that is obviously not possible if there is no effective vaccine. The CEA found that technologies that could deliver sufficient doses of more effective vaccine at the outset of an influenza pandemic could produce as much as a \$953 billion benefit for Americans — about half the total cost of an average pandemic. For various reasons, private market incentives alone are insufficient to develop and deploy such new vaccine technologies. The CEA recommended public-private partnerships such as those instituted this year to cope with the COVID-19 pandemic.

economic activity at the onset of a steep recession (see *Federal Reserve Actions to Support Markets and Credit Availability*).

These massive liquidity interventions carried out on an exceptional scale followed the classic prescription from Walter Bagehot, the 19th century creator of central banking theory, to “lend freely” to quell a panic. Within two months they led to generally stabilized equity, debt, and funding markets, with a notable recovery in equity and bond prices (see **Figure 4**) and a dramatic narrowing of risk spreads.

However, there is an essential difference between

Figure 4. Stock and Bond Markets Recovered (indexes)



Note: The ICE BaML Bond index is the Corporate Master Total Return Bond Index.

Sources: Intercontinental Exchange, Standard & Poor's, Haver Analytics, Office of Financial Research

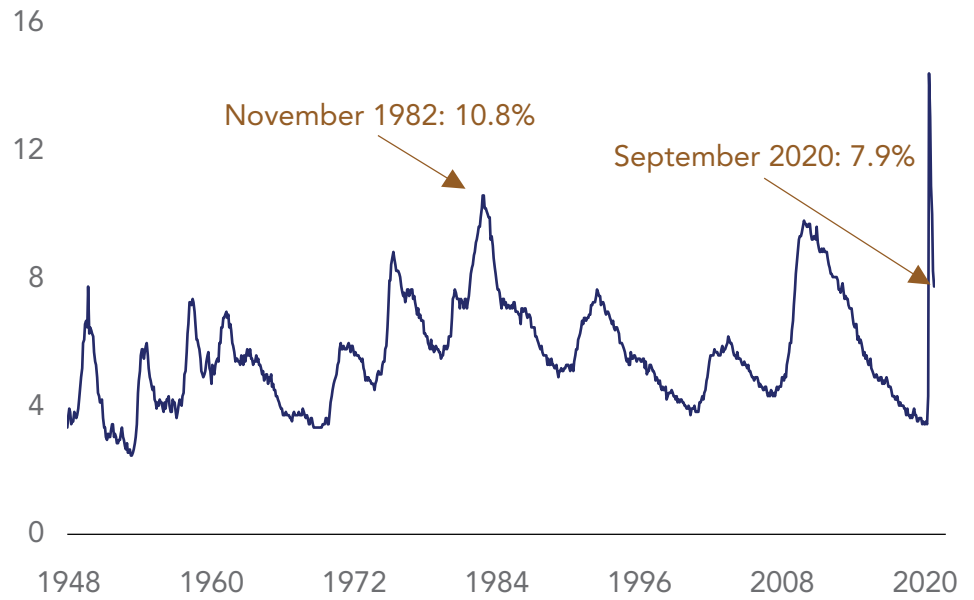
financial markets with “organic liquidity” reflecting the ongoing competitive market buying, selling, and risk bearing by private

actors, on one hand, and on the other, those requiring what we may call “synthetic liquidity,” which are dependent on large official

interventions and public absorption of financial risk. The latter, along with fiscal support, induced the April-May financial market recoveries. The objective of this synthetic liquidity was to create safe passage through the pandemic and shutdowns until organic liquidity returns.

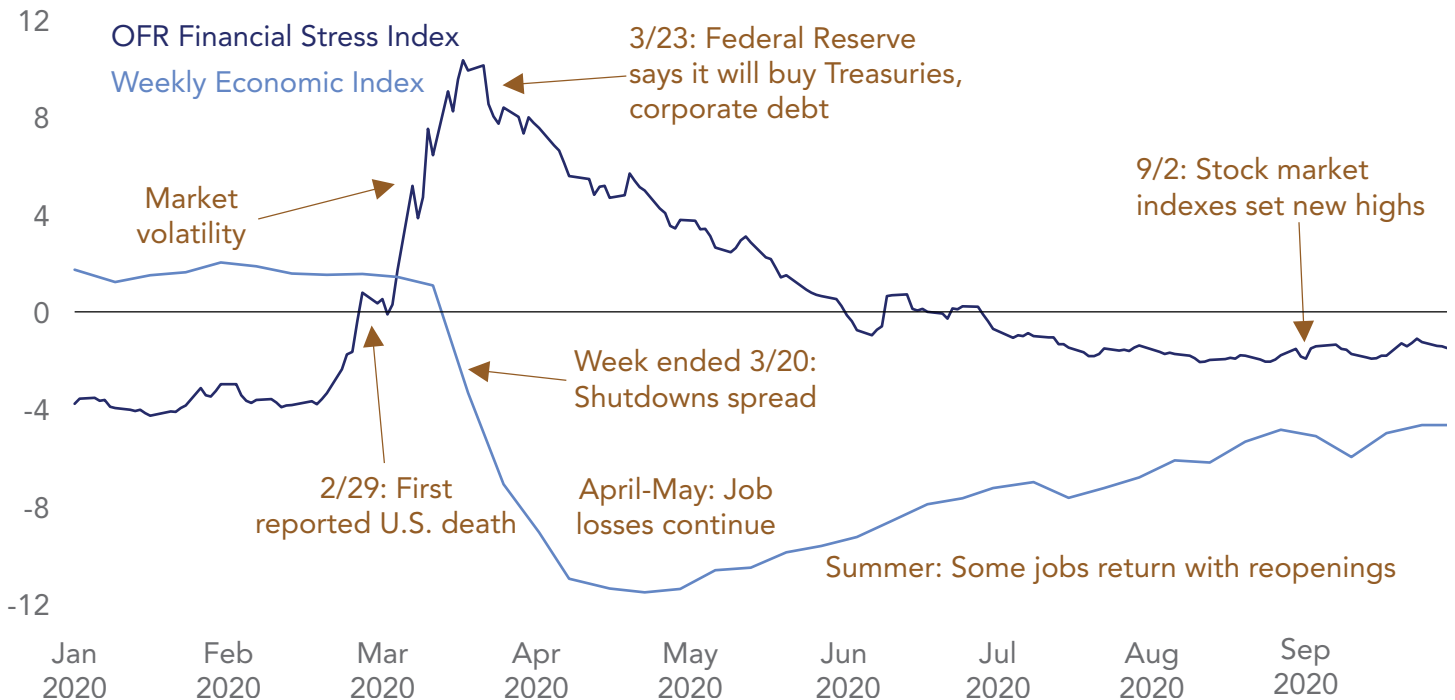
There remains a striking contrast between the quick recovery of financial markets and the slower recovery of the economy, which experienced the highest

Figure 5. U.S. Unemployment Rate Since 1948 (percent)



Sources: Bureau of Labor Statistics, Office of Financial Research

Figure 6. Economic Activity Stayed Weak as Financial Markets Rebounded (indexes)



Note: The Weekly Economic Index is an index of 10 daily and weekly economic indicators. It reflects what annualized percent change in gross domestic product would be if conditions persisted for a quarter. The OFR Financial Stress Index measures systemwide stress. It is above zero when stress levels are above average, and below zero when stress levels are below average.

Sources: Federal Reserve Bank of New York, Office of Financial Research

unemployment rate since World War II (see **Figures 5 and 6**). The possibility remains for heavy ongoing credit losses and failures. Consumer spending and business investment face pervasive uncertainty about the course of the pandemic and its consequences.

Credit risk is a primary concern going forward. Credit default swap (CDS) prices began signaling stress in the corporate credit market during March. The median single-name CDS spread rises in crises,

but the increase in risk is uneven across firms. The riskiest firms suffer a disproportionate rise in borrowing costs when a shock hits. While the financial services industry played a large role in 2007-09, consumer goods and services firms were most affected this year.

Also reflecting increased credit risk, as of September 30 the stock prices of banks were down 36 percent from the start of the year, and as of June 30 their provisions for loan

losses had dramatically escalated (see **Figures 7 and 8** and *Current Expected Credit Loss Accounting Framework*).

In sum, the reality of COVID-19 disruptions was worse than the most severe stress tests projected. We now appear to be moving from having stabilized markets to addressing ongoing stresses in many sectors, potentially heavy credit losses, and heightened business failures.

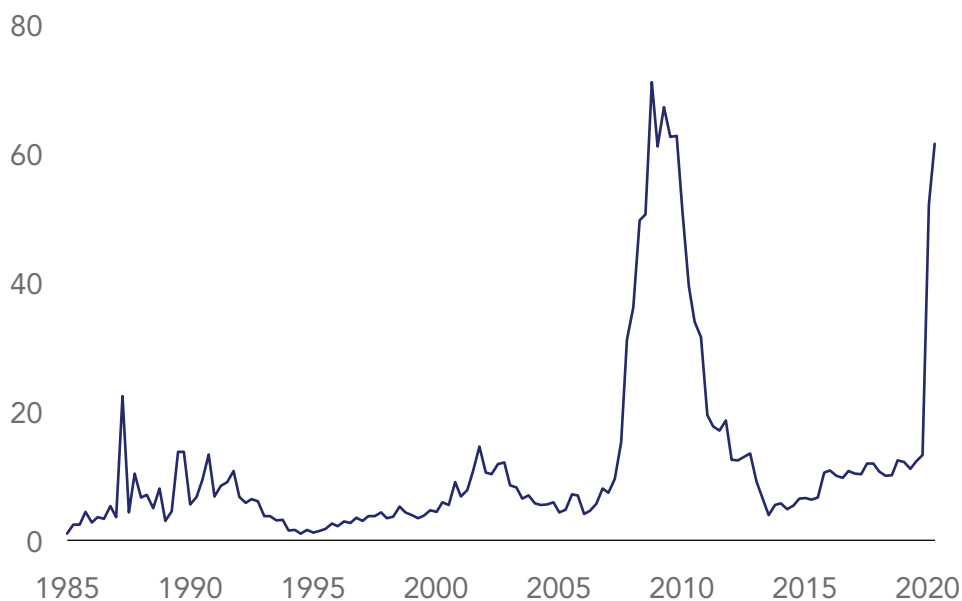
Figure 7. Bank Stock Prices Tumbled, Reflecting Investor Concerns (index)



Note: KBW Nasdaq Bank Index, which tracks 24 publicly traded banking stocks representing the large U.S. national money center banks, regional banks, and thrift institutions.

Sources: Nasdaq, Office of Financial Research

Figure 8. Bank Provisions for Credit Losses Rose Sharply (\$ billions)



Note: Data as of June 30, 2020. Includes all FDIC-insured institutions. Provisions in 2020, in part, reflect adoption of the current expected credit loss accounting framework among many larger banks.

Sources: Federal Deposit Insurance Corporation, Haver Analytics, Office of Financial Research

FEDERAL RESERVE ACTIONS TO SUPPORT MARKETS AND CREDIT AVAILABILITY

The Federal Reserve took a very aggressive series of actions to support the financial system through the effects of the pandemic. The Federal Reserve started by announcing changes to standing facilities and programs to provide liquidity. The Federal Reserve Bank of New York expanded its repurchase agreement operations. The Federal Reserve also lowered the primary credit rate, the interest rate it charges most banks at the discount window, from 1.75 percent to 0.25 percent. It also extended credit for up to 90 days rather than 30 days, and encouraged banks to use the window and intraday credit from the Federal Reserve. It also took steps to ease bank capital and liquidity buffers and reserve requirements.

The Federal Reserve also announced changes to enhance the provision of U.S. dollar liquidity through its standing U.S. dollar swap line arrangements. These swap lines are standing facilities with key foreign central banks. The lines allow those central banks to exchange domestic currency for U.S. dollars to satisfy the dollar liquidity demand of local banks and businesses. Later, the Federal Reserve expanded the set of central banks with which it has swap lines. It also created the **Foreign and International Monetary Authorities (FIMA) Repo Facility**, which allows foreign central banks and international monetary authorities with which the Federal Reserve doesn't have swap agreements to borrow dollars against Treasury securities instead of selling those securities.

To stabilize short-term funding markets, the Federal Reserve reestablished several credit facilities that were first used in the 2007-09 financial crisis. Some were set up under the Federal Reserve's emergency section 13(3) authority with the funding approval of the Treasury Secretary. Others were established by Title IV of the Coronavirus Aid, Relief, and Economic Security Act (CARES Act), with the funding approval of the Treasury Secretary. Although the facilities did not go into effect for days or weeks, market conditions began to improve with the initial announcements in mid-March that they would be available.

- Under the **Primary Dealer Credit Facility (PDCF)**, the Federal Reserve Bank of New York made collateralized loans to primary dealers, which are the banks and securities broker-dealers designated to serve as trading counterparties in carrying out U.S. monetary policy.

- The **Money Market Mutual Fund Liquidity Facility (MMLF)** allowed the Federal Reserve Bank of Boston to provide loans to eligible financial institutions to purchase assets from certain types of money market funds.
- The **Commercial Paper Funding Facility (CPFF)** financed commercial paper issuance. Primary dealers serve as intermediaries for issuance requests.

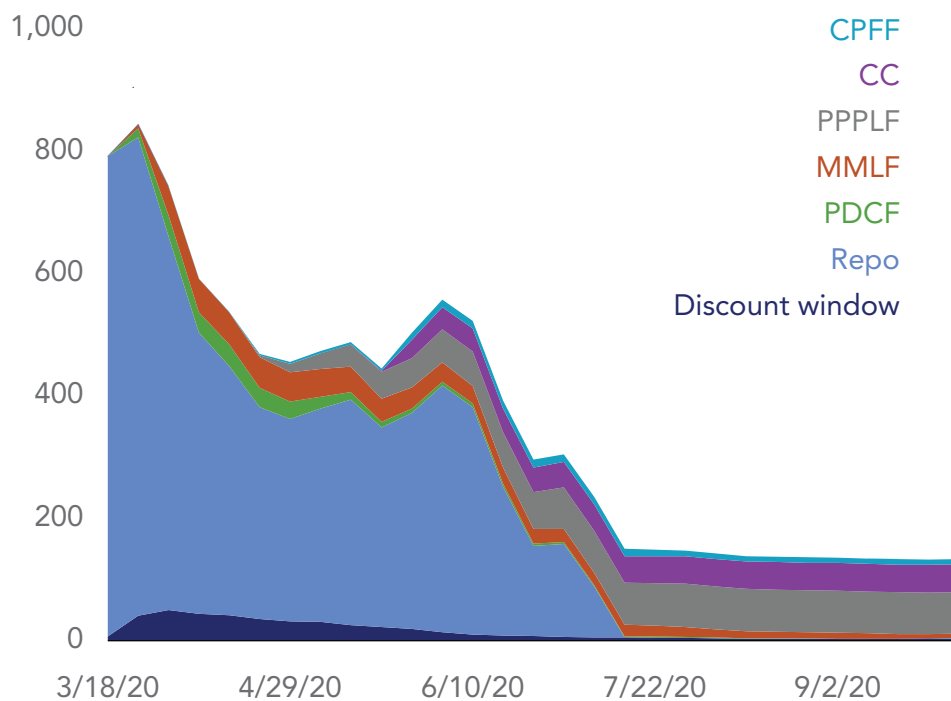
The Federal Reserve also acted to support the flow of credit to households and businesses. It expanded the scope of existing facilities and created mostly new credit facilities, also under its section 13(3) authority.

- The **Term Asset-Backed Securities Loan Facility (TALF)** financed the issuance of securitized auto loans, equipment leases, credit card loans, and other loans. The TALF was used during the 2008 crisis, from March 2009 until June 2010.
- The **Primary Market Corporate Credit Facility (PMCCF)** and the **Secondary Market Corporate Credit Facility (SMCCF)** provided support to corporate bond markets. The PMCCF stood ready to purchase new bonds and loans issued by corporations, while the SMCCF supported trading of existing corporate bonds. The SMCCF also purchased corporate bond exchange-traded funds.
- The **Paycheck Protection Program Liquidity Facility (PPPLF)** allowed the Federal Reserve Banks to extend credit to lenders participating in the Small Business Administration's Paycheck Protection Program (PPP). The PPP provided potentially forgivable loans to small businesses so that they can keep their workers on the payroll. The PPPLF was designed to bolster the effectiveness of the PPP.
- The Main Street Lending Program included three facilities to support small and medium-size businesses and their employees – that is, the **Main Street New Loan Facility (MSNLF)**, the **Main Street Expanded Loan Facility (MSELF)**, and the **Main Street Priority Loan Facility (MSPLF)**. In July, the Federal Reserve added facilities to lend to nonprofit organizations, the **Nonprofit New Loan Facility** and the **Nonprofit Expanded Loan Facility**.
- The **Municipal Liquidity Facility (MLF)** allowed the Federal Reserve to buy up to \$500 billion in short-term debt issued by state and local governments, with loss protection provided by the U.S. Treasury. This program helped municipalities borrow for their unexpected cash needs

during the crisis. To date, there have been two borrowers, both experiencing severe financial stress: the State of Illinois and the New York Metropolitan Transportation Authority.

The use of the various facilities reflected the degree of stress on the economy and financial sector over time (see **Figure 9**). Vulnerabilities remain from the uncertain course of the virus and the economic and political responses to it. The Federal Reserve’s ability to quickly extend or reinstate any of these steps is a source of market support.

Figure 9. Credit and Liquidity Facility Use (\$ billions)



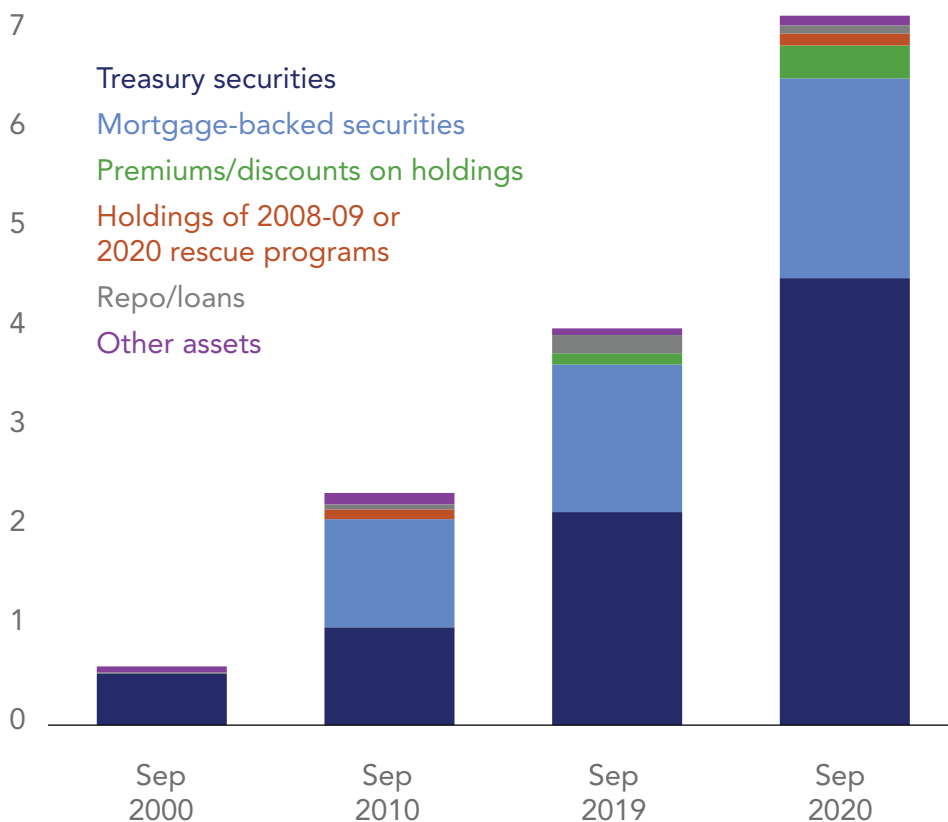
Note: Includes primary discount window lending and the various repurchase agreement (repo), Primary Dealer Credit (PDCF), Money Market Mutual Fund Liquidity (MMLF), Paycheck Protection Program Liquidity (PPPLF), Corporate Credit (CC), and Commercial Paper Funding (CPFF) facilities.

Sources: Board of Governors of the Federal Reserve System, Haver Analytics, Office of Financial Research

At the same time, the Federal Reserve continues to hold more than \$4 trillion in Treasury securities, \$2 trillion in mortgage securities, and total assets of \$7 trillion (see **Figure 10**).

The longer term effects of these interventions remain uncertain.

Figure 10. Federal Reserve Assets (\$ trillions)



Note: Data as of week including September 30 for Federal Reserve System assets. Treasury securities also include other federal debt securities. Mortgage-backed securities are backed by Fannie Mae, Freddie Mac, and Ginnie Mae. Premiums/discounts are unamortized differences between purchase price and face value of securities held. Holdings of 2020 programs are net holdings of Commercial Paper Funding Facility II, Corporate Credit Facilities, Main Street Facilities, Municipal Liquidity Facility, and TALF II; holdings of 2008-09 programs are net holdings of several programs established during that financial crisis. Repo/loans includes cash value of repurchase agreements collateralized by Treasury and federal agency securities, plus loans through Primary Dealer Credit Facility, Money Market Mutual Fund Liquidity Facility, Paycheck Protection Program Liquidity Facility, and other credit extensions. Other assets are all other assets as reported on Release H.4.1.

Sources: Board of Governors of the Federal Reserve System, Office of Financial Research

FINANCIAL STABILITY AND ECONOMIC OPPORTUNITY

The term “financial stability” implies that a financial system can provide its basic functions for the economy, even under stress from unexpected events, without emergency central bank and taxpayer support. These functions include, for example, reallocating funds from savers to borrowers and managing payments and risk. Threats to stability can arise from vulnerabilities exposed by unexpected events, or shocks. Vulnerabilities can be cyclical, such as the potential for increased leverage and risk-taking during times of low interest rates. Or they can be structural, such as the spread of defaults via market interconnections. Shocks can originate from inside the financial system, such as when a large bank collapses, or from outside the financial system, as with the pandemic of 2020, the oil cartel embargo of the 1970s, or major wars.

The financial system can be conceived narrowly as the network of private financial actors of all kinds,

or broadly, to include the central banks and all the government agencies that regulate, insure, guarantee, and monitor financial risks.

WHY IS FINANCIAL STABILITY IMPORTANT?

Financial stability is necessary for households, as well as businesses small and large, to build and further their economic opportunities. A deep and broad body of research reveals considerable historical and contemporary evidence that the coexistence of financial sector development and economic opportunity reflects more cause and effect than coincidence.² The president of the Federal Reserve Bank of New York went a step further, characterizing financial stability as a “prerequisite for sustainable economic growth.”³

Financial development, among other things, requires organizational leaders to effectively address information frictions (such as adverse selection and moral hazard) and other transaction cost hurdles that can discourage capital from finding and engaging its most promising projects.

This channel is crucial for empowering financial services to advance productive innovations, and thus promote the economic growth necessary to reliably increase living standards over time.⁴

HOW DOES THE COVID-19 PANDEMIC THREATEN THAT STABILITY?

The COVID-19 pandemic has threatened, and may continue to do so for some time, both robust economic growth and the stability that financial services can offer.⁵

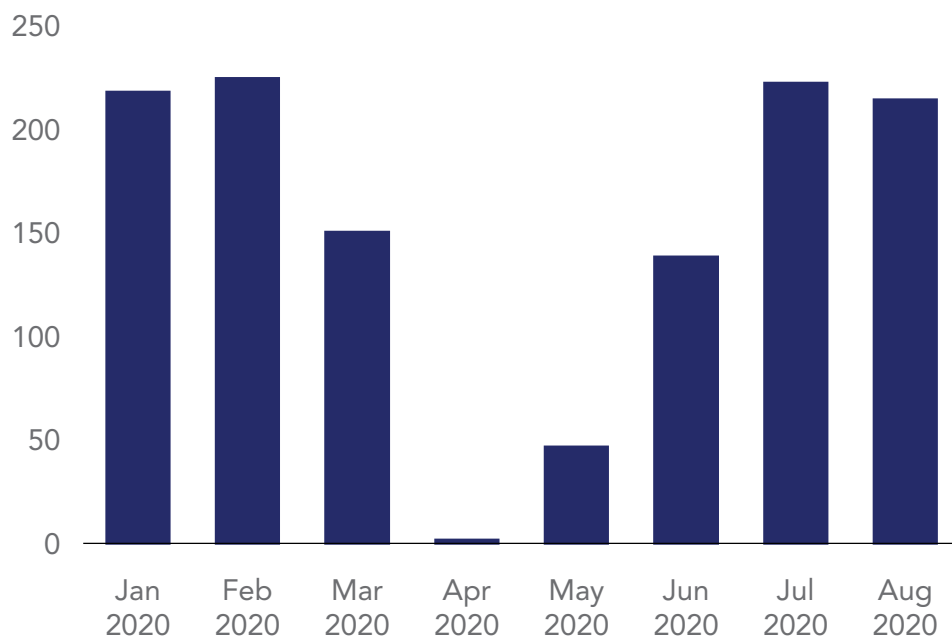
The COVID-19 crisis struck without announcing itself in advance, unlike some previous crises (for example, the financial crisis of 2007-09 and the savings and loan crisis of the 1980s, both of which involved mortgage finance).⁶ As the International Monetary Fund’s First Deputy Managing Director recently reminded an audience, the Fund’s 2020 forecast anticipated positive economic growth in most countries. Instead, by midyear, the Fund estimated that 90 percent of countries would see negative growth.⁷ No official financial stability report, as discussed above,

addressed the potential for a pandemic to threaten financial stability.

Economic indicators on the eve of the 2020 crisis showed little if any concern about a slowdown, let alone a sharp economic contraction. For example, the U.S. civilian unemployment rate for February 2020 dropped to a 50-year low of 3.5 percent. It spiked to 14.7 percent just two months later.⁸ The abrupt change in automobile production — an important component of U.S. manufacturing with strong economic multiplier effects — illustrates the remarkably sharp drop in economic activity, followed by a recovery (see **Figure 11**). Where we go from here depends on how the virus evolves and how people and governments react to that evolution.

The COVID-19 crisis also heightened previously known vulnerabilities. Examples include the extent of leveraged lending and commercial real estate exposures (see **Part 2, Credit Risk**), high-risk asset prices (see **Part 2, Market Risk**), and dependencies among participants in funding markets (see **Part 2, Liquidity and Funding**

Figure 11. Domestic Auto Production Stalled in April as Plants Closed, Then Recovered (thousands of units)



Note: Data as of August 2020. U.S. passenger car production, seasonally adjusted.

Sources: Bureau of Economic Analysis, Office of Financial Research

Risk). These vulnerabilities, and others, are discussed later in this report.

HOW HAVE PREVIOUS CRISES THREATENED FINANCIAL STABILITY AND ECONOMIC OPPORTUNITY?

The United States has experienced periodic economic and financial system turmoil since declaring its independence, reflecting the circumstances of the various times.

We consider a brief review of several notable episodes

of instability, starting in the 1790s. Under Alexander Hamilton's banking plan to finance economic growth, the First Bank of the United States and the market for U.S. Treasury bonds were established. Then speculative players entered, fraud emerged, borrowers defaulted, and credit tightened. Hamilton organized a rescue in which the government purchased its own securities, a key precedent for intervention.

After the War of 1812, the country experienced the "Era of Good Feelings." Credit expansion fueled

growth, but ended with businesses and farms failing in the Panic of 1819.

The financial crisis of 1837 generated failures and depression running into the 1840s, including defaults on several U.S. states' debt. The federal government refused to bail out those states.

Prosperous booms and occasional busts marked the development of the nation. The prosperity of the 1850s, boosted by the California Gold Rush and a boom in railroad development, ended with the Panic of 1857.

The Civil War was followed by eight years of prosperity, until bank, business, and numerous railroad failures followed in the Panic of 1873.

The late 19th century was a time of remarkable innovation and growth, but included the Panic of 1893. The early 1900s were scarred by the Panic of 1907, which generated the political will to address the "banking problem," leading to the creation of the Federal Reserve in 1913. The Federal Reserve System was launched with the belief that it would prevent

any future financial crises, but it didn't.

The onset of World War I triggered the Global Financial Panic of 1914, closed stock markets, including the New York Stock Exchange, and led to inflationary war finance. In 1918, when the United States had entered in the war and was making loans to allied governments that would later default, it was also battling a deadly influenza pandemic, which continued into 1919 with disastrous global impact.

In the wake of thousands of bank failures in the Great Depression, the Federal Deposit Insurance Corporation (FDIC) was created in 1933 to promote confidence that deposits in banks were safe. This halted runs on the banks, but at the cost of serious moral hazard that emerged in the 1970s and 1980s.

In the post-World War II years, there were two decades of notable generalized prosperity, in spite of gloomy 1940s forecasts of "secular stagnation." But in the 1970s financial instability reappeared. There was a panic in the commercial paper market brought on

by a lack of confidence in issuers, which the Federal Reserve addressed by making the discount window available to a number of commercial banks. There was also a commercial real estate lending crisis, the "Great Inflation" emerged, New York City spiraled toward bankruptcy, and a cartel of oil-producing countries sent oil prices soaring and supply dwindling.

The financial instability of the 1980s saw multiple bubbles burst. Oil prices collapsed — among other casualties were all the biggest banks in Texas. Farmland prices dropped and the Farm Credit System, a government-sponsored enterprise, had to be bailed out. Less developed countries, as they were then called, defaulted on their loans and ignited a global debt crisis. The savings and loan industry collapsed, and its government insurer, the Federal Savings and Loan Insurance Corporation, itself became irreparably insolvent and was bailed out by taxpayers. In the early 1990s, there was a commercial real estate collapse. More than 1,000 commercial banks failed

between 1982 and 1992. But the Great Inflation ended and rapid economic growth returned, bringing in what was later called “The Great Moderation.”

With the speculations of the dot.com bubble of the 1990s and with the 2000s housing and commercial real estate bubbles and the 2007-2009 financial crisis, we are sufficiently familiar.

What conclusions can be drawn from this quick review? On average, the story of the United States from its first days of liberty to now is an upward plotline of productivity with increases in standards of living, wealth, health, education, and comfort. But this admirable trend has frequently been interrupted by periods of financial instability.

Reliably stable financial organizations and markets are critical for continually creating greater and more widely shared economic opportunity. The loss of life and productivity, as well as associated uncertainty from the COVID-19 crisis, proved capable of compromising the ability of financial markets and organizations to further economic opportunity.

HOW CAN FINANCIAL STABILITY BE MAINTAINED?

A more reliably stable financial system is important for a more robust economy. Unfortunately, however, business cycle management is fraught with complexities. Strengthening the reliability of a more stable financial system can more consistently support the necessary intermediation to turn financial claims into tangible resources for the real economy.

Our financial system can be made more reliable through the identification and mitigation of vulnerabilities that can lead to instability during times of stress. The OFR works through several channels to support America’s financial stability through its data resources and analytical expertise.

Research and data services to the Financial Stability Oversight Council (FSOC) and its members. The OFR principally serves the FSOC through close coordination on identifying and producing germane research, analysis, and data that can further insights into financial vulnerabilities and their mitigants. Our

Office supports the FSOC through applied analysis and long-term research by monitoring, analyzing, and reporting on developments in the financial system and their impact on systemic risk. The OFR also develops tools for measuring and monitoring risks. To that end, our Office’s work gains information through frequent collaboration with subject matter experts from the FSOC and its subcommittees. The OFR directly supports the FSOC by collecting, validating, and maintaining data necessary to carry out its duties. The OFR aggregates, edits, and makes data available for analysis and research, while safeguarding confidentiality and security. The OFR also works with regulators and industry standards bodies to identify and develop standards that are critical to improving data quality. The Office promotes the use of these standards to advance financial research and monitoring.

OFR monitors. The OFR has developed a collection of risk monitoring tools made publicly available through its website (www.financialresearch.gov). With these monitoring tools,

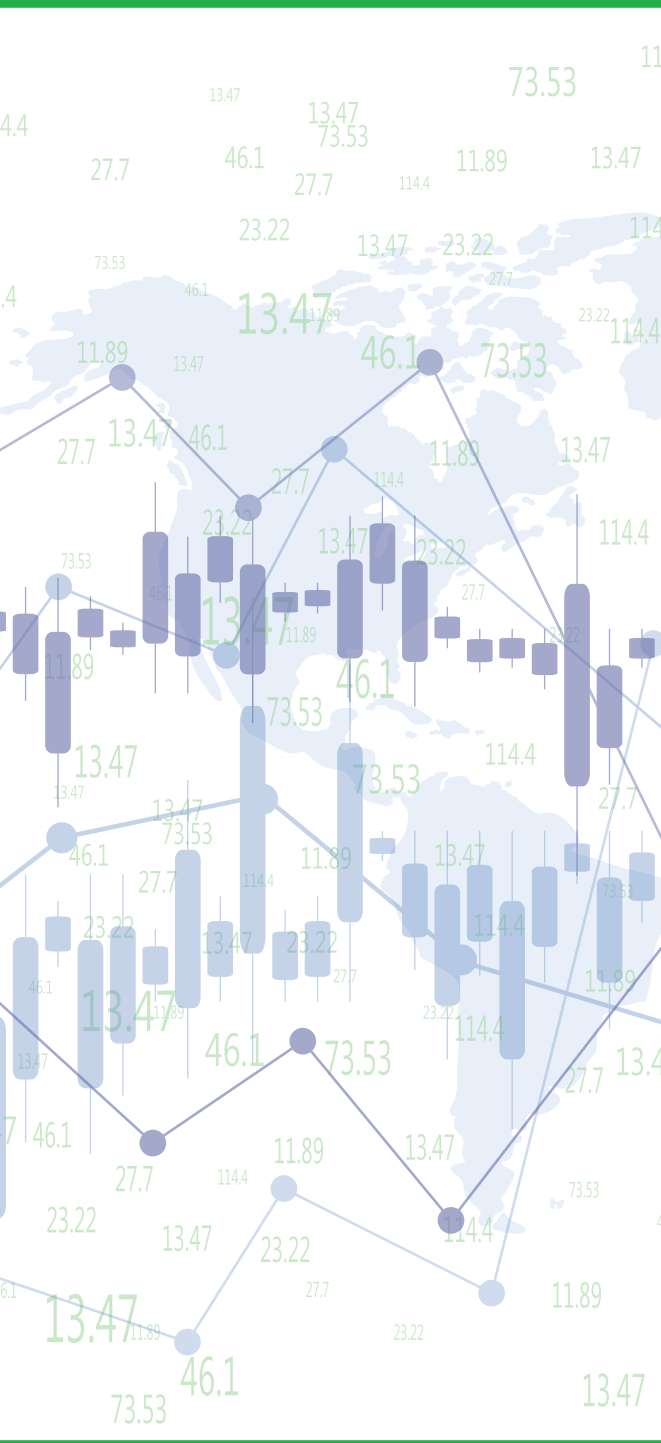
users can get a snapshot of financial markets at any given time, with the goal of timely identifying signals of vulnerabilities. The monitors increase market transparency and facilitate research on the financial system for financial industry participants (see **Part 4, Data Products**). The *Short-term Funding Monitor*, introduced in September 2020, presents daily information about these critical funding markets, which are the core of liquidity and maturity transformation in the financial markets. Data presented include repo market information collected daily by the OFR. The *Bank Systemic Risk Monitor*, introduced in February 2020, presents key measures for monitoring systemic risks posed by the largest banks. And our Office's *U.S. Money Market Fund Monitor* tracks the investment portfolios of money market funds. Finally, OFR's *Financial Stress Index* serves as a daily market-based snapshot of stress across global financial markets.

Complementing research and monitors with insights from information markets.

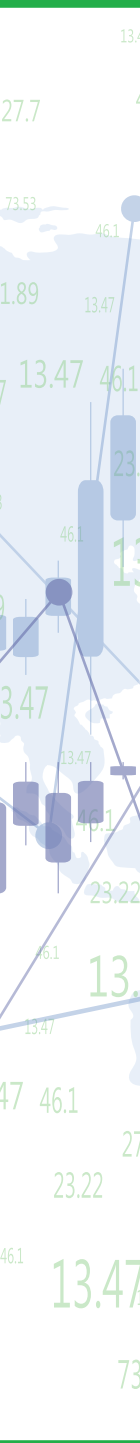
The assessment in this

Annual Report relies on conventional monitoring of vulnerabilities based on research and data insights. But as this report's introduction highlights, none of the 30 prominent 2019 financial stability reports mentioned the potential for financial instability from a pandemic. Even if someone may have had remarkable insights to such a vulnerability, that person may not have had sufficient incentive to share those insights at a scale that could have made a material difference.

Markets in "information" or "predictions" have shown promise in addressing such problems by encouraging people who have superior information to share it at consequential scale. Qualitatively related markets already operate on platforms such as the Iowa Electronic Markets (iem.uiowa.edu) and Predict It (www.predictit.org). Developing such markets in the service of strengthening financial stability may also help reveal costly or otherwise hidden information that can play a fundamental role in creating systemic risks (see **Part 3, Exploration of Information Markets**).



PART TWO: ASSESSING FINANCIAL RISKS AND UNCERTAINTY



PART TWO: ASSESSING FINANCIAL RISKS AND UNCERTAINTY

Significant downside risks to financial stability persist amid high uncertainty. In our assessment, the risks to financial stability primarily reflect uncertainty about the future course of the pandemic and its economic

and financial consequences, the long-term effects of the economic damage from months of lockdown and ongoing restrictions (including the extent of credit losses and bankruptcies), and future

financial effects of the emergency actions taken. Risk remains elevated in comparison with last year across most risk categories (see *Summary of Risks*.)

SUMMARY OF RISKS

Macroeconomic risk is high. The course of the pandemic remains uncertain, as does the shape and pace of economic recovery. Government interventions provide support, but could come at the cost of higher inflation.

Credit risk is high. Leverage is high among nonfinancial corporations. Some lenders to the commercial real estate, energy, and high-touch service sectors face potentially severe losses from borrower defaults and bankruptcies. Municipal governments have serious revenue shortfalls. Some sovereign borrowers may seek bondholder concessions.

Market risk is elevated. Although stress in March led to a sell-off, the financial system remained resilient with help from the Federal Reserve. However, a midyear return to elevated valuations for many risky assets could provide potential tinder for another round of market stress.

Liquidity and funding risks are moderate. Risks and funding costs rose with the market turmoil in March, but the Federal Reserve's liquidity facilities and banks' liquidity buffers helped conditions stabilize quickly. Codependence between large providers and users of short-term funding remains a key vulnerability.

Leverage in the financial system has been restrained since the last crisis.

Leverage amplifies losses. Financial system leverage rose in the first quarter as bank lending expanded to support the economy, but fell for hedge funds and some other financial firms exiting certain trading or investment positions. As of midyear, financial system leverage stabilized at a comparatively low level. Low financial system leverage could reduce risk of financial firm insolvencies arising from amplified losses.

Insolvency and contagion risks appeared contained. Bank loan loss provisions have increased sharply with expected losses, while capital buffers already in place appear to provide an adequate cushion for unexpected losses by banks and insurers over the near term. No large financial firm failures, or chains of failures, were observed during March.

Cyber risk grows both in volume and sophistication. While financial sector investment in cybersecurity can further the resilience of financial networks and systems, escalating threats from a variety of bad actors, as well as those that can emerge from increased dependence on remote work as a result of the pandemic, could aggravate vulnerabilities. The development of quantum computing presents a longer-term risk.

Pandemics can be added to the list of additional financial stability risks. Natural disasters, the United Kingdom’s exit from the European Union, and the transition from LIBOR to an alternative reference rates remain potential sources of risk.

This year’s COVID-19 pandemic has affected all these risk categories. It has greatly heightened overall uncertainty. It first caused market, liquidity, and funding risks to increase sharply. Government interventions relieved stress in the financial sector, leaving credit risk as the primary source of potential lender insolvencies, either directly or via potential contagion. Credit risk, in turn, reflects fundamental sectoral vulnerabilities plus the current high level of macroeconomic risk.

MACROECONOMIC RISK

Economic activity slowed dramatically due to the COVID-19 pandemic and the unprecedented

government response to curtail public health risk. Governments acted to slow the spread of illness by closing many business operations and limiting others — effectively, a huge supply shock to

the economy. Individuals limited their activities in compliance with government orders and out of fear — a huge demand shock. The international spread of the pandemic saw these shocks reverberate

through the global supply chain and export activity. They also appear to be changing the mix of production and jobs.⁹

Unprecedented policy responses involving hitherto unimagined central bank expansion and fiscal transfers helped support the economy, provide financial resources to those harmed by the recession, and finance the losses and the gross domestic product (GDP) shrinkage as the nation struggled to weather the pandemic.

Signs of improvement became evident by midyear, with considerable monetary and fiscal stimulus facilitating a bridge to economic recovery. Macroeconomic risk, nevertheless, appears unusually high in light of deep uncertainty about the pandemic's course.

U.S. ECONOMIC CONDITIONS

The U.S. economy showed considerable strength through the first two months of 2020. February's employment report saw 273,000 jobs created and a remarkably low unemployment rate of 3.5

percent. Reduced interest rates that the Federal Reserve put in place during the second half of 2019 provided a strong dose of stimulus for the housing sector. New home sales hit highs not seen since before the 2007-09 crisis. That helped drive up residential construction at an annual rate of almost 18 percent for the first quarter.

The first reported COVID-19 fatality in the United States came in February. Beginning in March, the economy deteriorated rapidly. Evidence came quickly from industries that had people in close proximity and more vulnerable to the spread of the virus. Occupancy at U.S. hotels, as an example of a vulnerable industry, fell from 62 percent for the week ended March 7 to 30 percent for the week ended March 23.¹⁰ Conferences and group events were cancelled across the nation. Restaurant and movie theater business collapsed over the same weeks (see **Figure 12**). That was all before the last two weeks of March, when most states severely restricted business and individual activities to contain the pandemic. For March as a whole, general operating profit per room

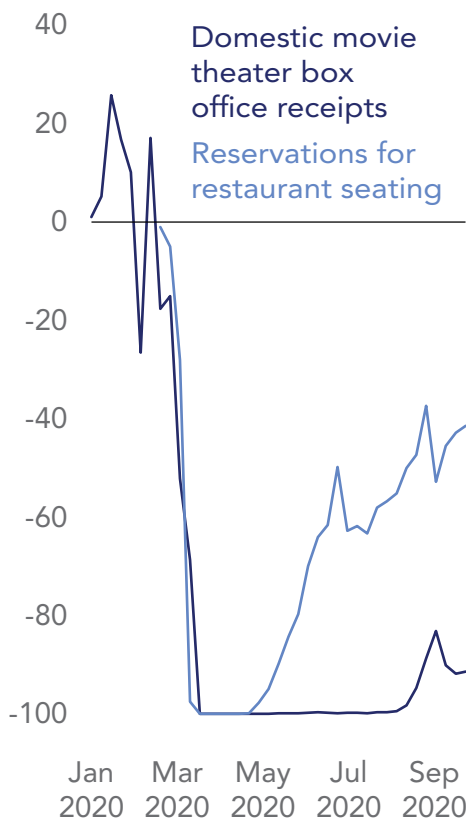
for the U.S. hotel industry was down 102 percent from a year earlier.¹¹ Clothing sales fell 49 percent in March, and restaurant and bar sales dropped by almost a third.

In addition to its direct, measurable impact on demand, the COVID-19 crisis disrupted supply chains. Many U.S. companies rely on global suppliers, particularly suppliers in China, as the latter contributed to 18 percent of all 2019 imports. The pandemic-driven supply shock amplified the drop in demand, as businesses sought to find new trading partners and to alter products. More generally, U.S. firms depend on trade with parts of China affected by the pandemic. Some studies suggest that more than 15 percent of Fortune 1000 companies have Tier 1 suppliers — companies that directly sell them products — in a virus-affected Chinese region. Ninety percent have a Tier 2 supplier, one step further away in the supply chain.¹² These linkages contributed to a significant drop in trade. In February, when China was struggling with the virus, U.S. imports of select products from

China (textiles, apparel, computers, and others) dropped more than 10 percent compared with a year earlier.¹³

Unemployment quickly followed in the wake of these disruptions to demand and supply. In

Figure 12. Social Distancing Shut Down Movie Theaters and Restaurants (year-over-year percent change)



Note: Reservations measured as seated diners on the OpenTable Network: online reservations, phone reservations, and walk-ins. Changes to gross box office receipts and reservations compare the same day of the week from year to year.

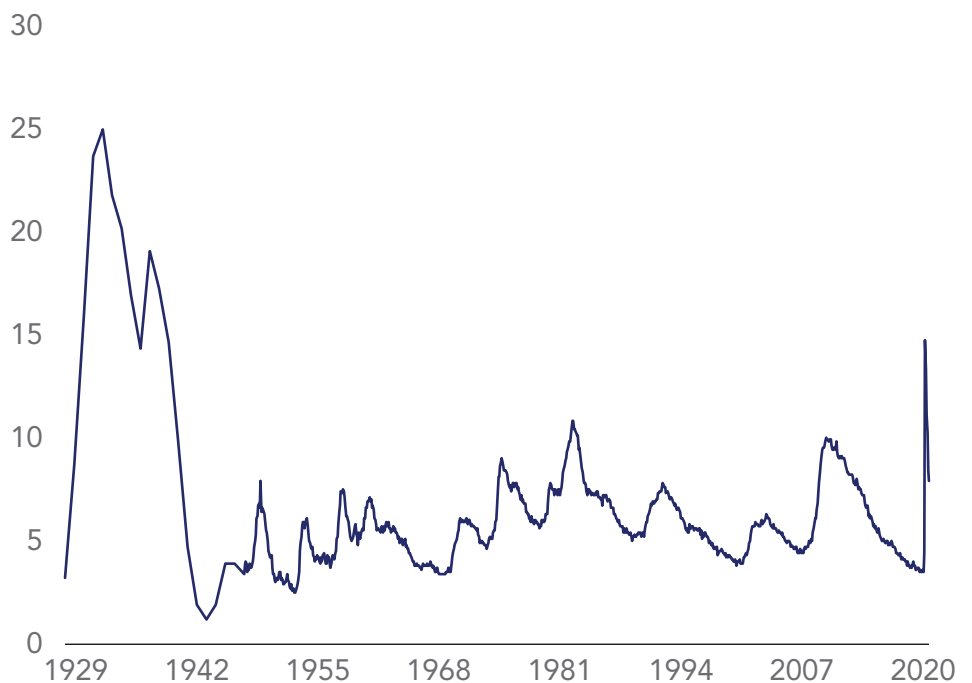
Sources: OpenTable, Box Office Mojo, Office of Financial Research

March, the number of nonfarm payroll employees shrank by 1.4 million, followed by a historic drop of 20.8 million in April.¹⁴ As a result, what had been a 50-year low unemployment rate in February was replaced in April with a rate not seen since the Great Depression (see **Figure 13**). The 14.7 percent unemployment rate far surpassed the previous post-World War II high of 10.8 percent in late 1982.

Amid these conditions, the U.S. economy entered a steep recession.¹⁵ It

shrank 1.3 percent in the first quarter, or an annualized rate of 5 percent, and 9 percent in the second quarter, or an annualized 31.4 percent, the steepest quarterly drop in records dating back to 1947. Standards for many types of credit tightened in those periods. This tightening helped limit credit risk for lenders as the quality of their existing credit deteriorated, but also made it harder for households and businesses to cushion the impact of the slowdown. While the

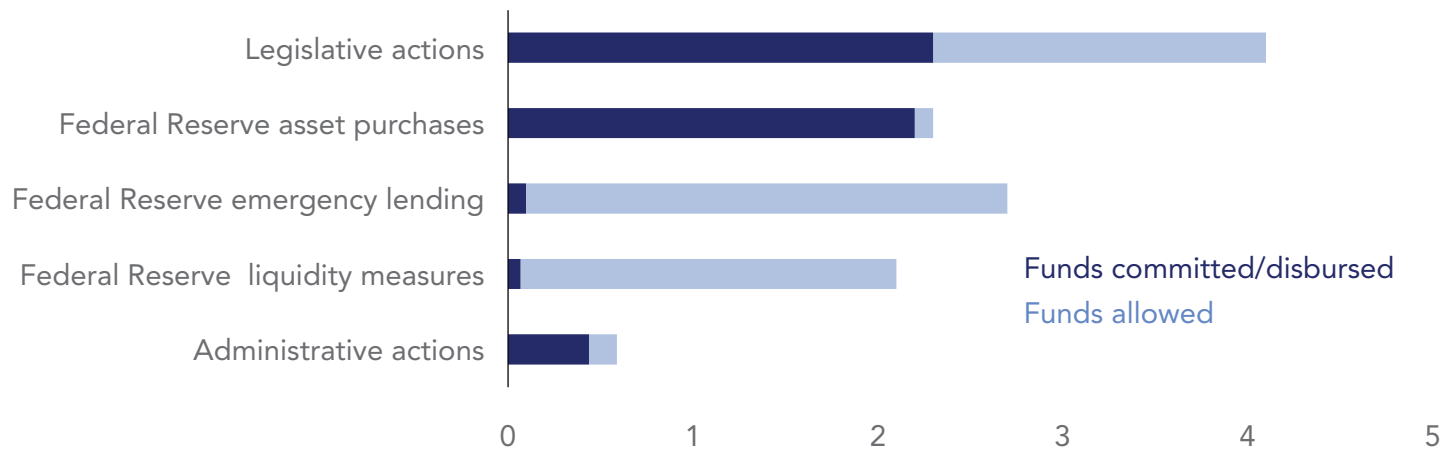
Figure 13. U.S. Unemployment Rate Since 1929 (percent)



Note: Data from 1929-39 were developed by the Bureau of Labor Statistics, but do not come from the Current Population Survey (CPS), the household survey that is the source of the data beginning in 1940. The monthly series begins in 1948; data prior to 1948 are annual.

Sources: Bureau of Labor Statistics, Office of Financial Research

Figure 14. Government Monetary and Fiscal Policy Actions Addressed Pandemic Effects (\$ trillions)



Note: Funds allowed include disbursed amounts for programs with no announced size limits.

Sources: Committee for a Responsible Federal Budget, Office of Financial Research

March-April downturn was rapid, extraordinary support from monetary and fiscal policy helped to mitigate the damage over the short-to-medium run (see **Figure 14**). That support also sent the federal budget deficit to a record high. Fiscal year (FY) 2020's \$3.1 trillion deficit easily beat the previous record of \$1.4 trillion for FY 2009. Further, when expressed in terms of the value of the dollar today, the FY 2020 deficit outpaces the FY 2009 deficit by \$1.4 trillion.

Economic activity bottomed in the second quarter, as mobility picked up and governments started to lift restrictions. Jobs reports discussing activity from May through September

showed that employers started to hire again, notably in sectors strongly affected by the pandemic. The leisure and hospitality industries, for example, accounted for more than 35 percent of new employment gains over that period. All told, by the end of September, 51.5 percent of jobs lost in March and April had been restored. The unemployment rate slowly declined from its April high of 14.7 percent to 7.9 percent by the end of September. Although much improved, the unemployment rate as of September was still high.

The third quarter saw a sharp rebound in real GDP of 7.4 percent following the second quarter's 9 percent

decline. These are quarterly, not annualized changes. This pattern of collapse and then recovery dwarfs the quarterly moves of the 2007-09 crisis (see **Figure 15**).

With residential mortgage rates at historic lows, partly due to accommodative monetary policy, home sales and mortgage refinancing have rebounded. Indicators of retail sales and other economic activity in the third quarter were also consistent with a return to economic growth. Amid this environment, with reduced consumer demand, steps to reconfigure business models and improve health and safety standards raised business costs. In line with the slowing pace of job

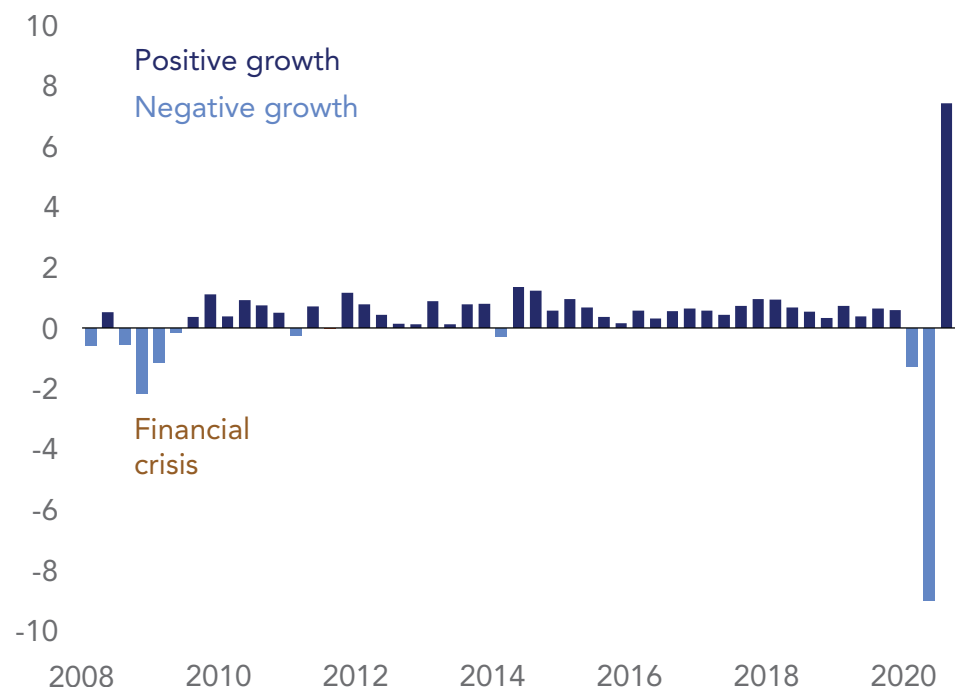
growth, the initial rise in consumer spending for May gradually reduced to 1 percent month-over-month growth in August.

Against this backdrop, economic risks to U.S. financial stability continue to be unusually high. Deep uncertainty remains about the course of the pandemic. As long as that is the case and most of the population remains vulnerable to the virus, the pandemic and actions to control it will continue to elevate macroeconomic risk. Efforts to avoid and contain the virus could continue to put pressure on economic activity and incomes. The ability of households and businesses to manage liabilities could, in turn, be reduced. Credit risk grows in turn (see **Credit Risk**), with the possibility of numerous defaults and bankruptcies. Household and business insolvencies feed back into macroeconomic risk, making the financial system more vulnerable to instability.

GLOBAL ECONOMIC CONDITIONS

Global economic conditions created headwinds for the United States' economy going into 2020. Growth slowed in major U.S. trading

Figure 15. U.S. Real GDP Change from Prior Quarter, Not Annualized (percent)



Note: GDP stands for gross domestic product.

Sources: Bureau of Economic Analysis, Haver Analytics, Office of Financial Research

partners, as uncertainty over trade tensions and the United Kingdom's exit from the European Union (EU) took hold. The fourth quarter of 2019, for example, saw Japan's real GDP fall 7.2 percent on an annualized basis, while growth in the eurozone slowed to its lowest rate in seven years. These conditions left economies and financial systems more vulnerable to distress from any shock. Given the pandemic, the International Monetary Fund (IMF) expects global growth to contract 4.4 percent in 2020 and expand 5.2 percent in

2021.¹⁶ To the extent that these expectations are realized, net growth could be negligible over the two years.

China, where the virus originated, was the first country to lock down. The virus spread quickly, and the consequent shock to economic activity was followed by a 6.8 percent contraction in the first quarter over a year earlier, its first such published negative growth rate since at least 1992.¹⁷ China reported a return to growth in the second quarter. However, the initial shock

created ripple effects elsewhere, disrupting supply chains and further weakening economies globally, beyond the effects of low demand and shutdown measures (see **Figure 16**).

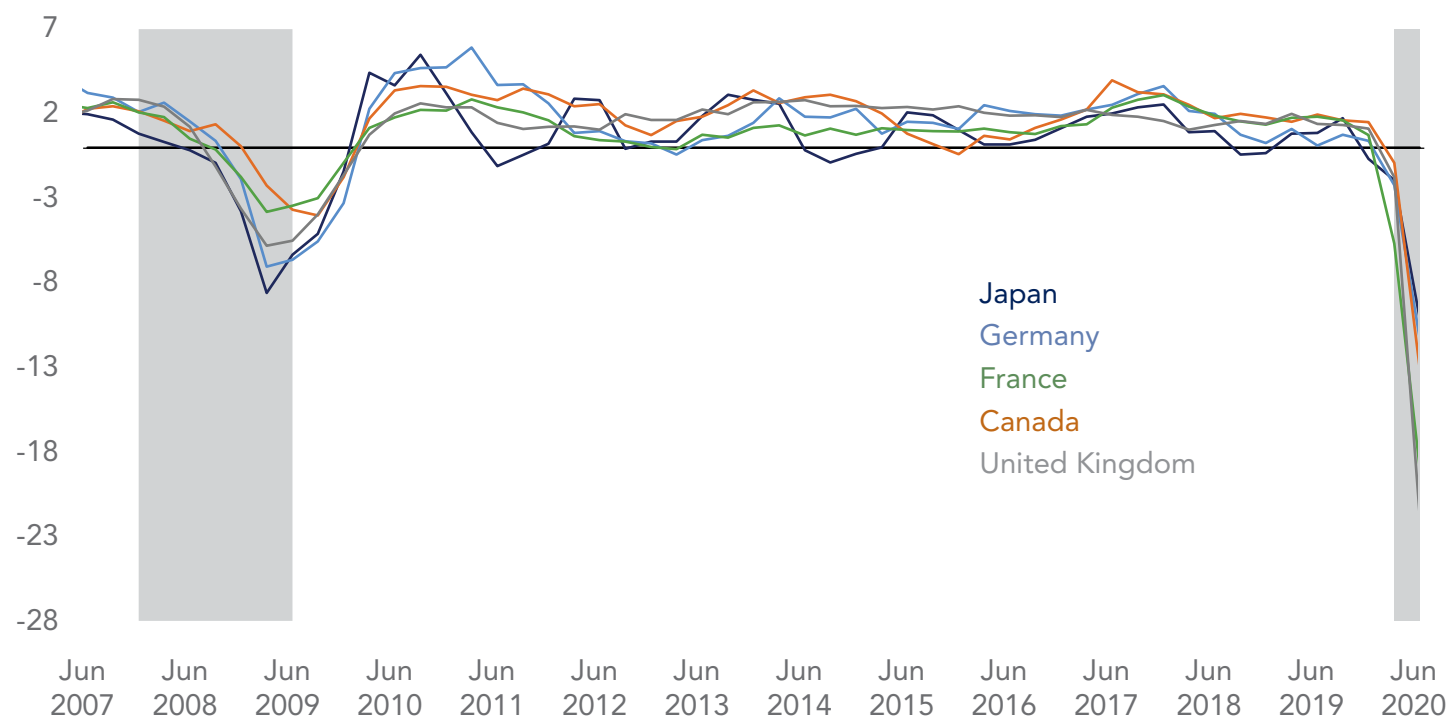
In the first quarter of 2020, Japan and two of Europe's largest economies, France and Italy, posted their second consecutive quarters of negative growth, placing them in a technical recession. For the eurozone as a whole, GDP growth contracted 3.7 percent, the largest quarter-on-quarter decline on record,

or at an annualized rate of 14.9 percent. Second quarter European growth slowed even more, the biggest drops since the EU was established in 1995.¹⁸ While an improvement is widely expected in the third quarter of 2020, economic indicators suggest a slow recovery. Continued declines in consumer and business sentiment in Europe are leading indicators of weak future demand.

The European Union is the top trading partner of the United States and the

second-largest of China. A potentially slow recovery in China, or a deeper or more protracted downturn in Europe, could weaken the outlook for global trade and increase macroeconomic risk to the United States. Similarly, a weak recovery in emerging market nations that engage in substantial trade with the United States could pose further downside risk for U.S. corporations. For example, Brazil, Mexico, India, and Vietnam were all among the top trading partners for the United States in 2019.

Figure 16. Growth in Major Economies (percent change from previous year)



Note: Data as of June 30, 2020. Real gross domestic product, percent change from corresponding quarter of previous year, seasonally adjusted. Some data are preliminary and subject to revision. Shaded areas are U.S. recessions.

Sources: OECD Main Economic Indicators, Office of Financial Research

POLICY RESPONSES

Macroeconomic policy responses to the COVID-19 economic crisis were extraordinary by historical measure. When financial market disruptions came to the United States, the Federal Open Market Committee further eased monetary policy. In the first half of March, the committee brought its policy rate to a range of 0 to 0.25 percent. Between March and the end of June, the Federal Reserve added \$2.8 trillion to its balance sheet, equivalent to 14 percent of GDP. Lower policy rates and Federal Reserve asset buying quickly restored financial market functioning and supported asset prices. In particular, equity prices as measured by the S&P 500 index, which had fallen by 34 percent from February 19 to its bottom on March 23, had recovered all of their losses by August.

Central banks from other advanced economies similarly provided very large monetary stimulus to cushion the contraction. For example, the European Central Bank (ECB), Bank of Japan, Bank of England, and Bank of Canada all

reduced and maintained their key short-term funding rates close to zero, or in some cases less than zero. With interest rates close to their lower bounds, central banks accelerated asset purchases, and at a pace faster than during the 2007-09 crisis. The ECB launched and later extended a pandemic-focused program to purchase eurozone government and corporate debt. This official bid helped reduce risk premiums on European sovereign and corporate debt. The ECB's other stimulus measures included a lower, negative interest rate on loans to banks and acceptance of non-investment grade, or junk, bonds as collateral for loans. Like the Federal Reserve, the Bank of Japan pledged to purchase unlimited government debt, while the Bank of England started its own program to buy corporate bonds and U.K. government bonds.

On the fiscal front, relief packages in the United States and elsewhere included loan programs, guarantees, debt forbearance, and wage subsidies to help firms avoid bankruptcy and maintain jobs. They funded targeted and untargeted

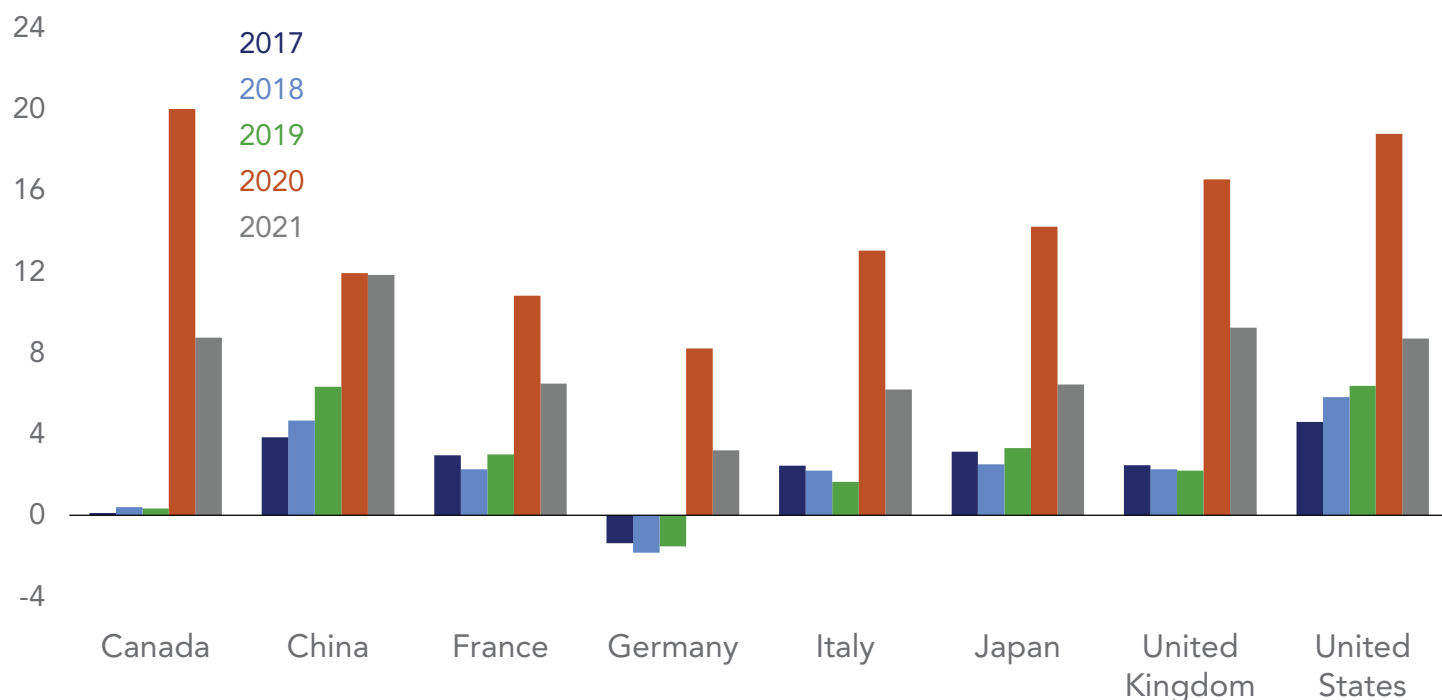
cash transfers to individuals, enhanced unemployment insurance benefits, and brought tax relief to support household cash flows and avoid defaults on consumer credit.¹⁹ The Coronavirus Aid, Relief, and Economic Security Act (CARES Act) mandated that certain loans in forbearance could not be reported as delinquent, even though not paying.

Authorized U.S. fiscal relief through May totaled almost \$4 trillion. The fiscal packages rapidly expanded central government borrowing as a share of GDP, well beyond the high levels seen in 2019 (see **Figure 17**). Federal debt held by the public reached \$21 trillion in FY 2020, or an estimated 99 percent of GDP at the end of FY 2020.

It remains to be seen what path the U.S. economy may take on the way to recovery, which remains a major risk to U.S. financial stability. Many households and businesses have not recovered even with government support.

Core inflation remains below the Federal Reserve's objective of a continuous 2 percent, although the consumer price index rose in June and July at

Figure 17. General Government Deficit, Actual and Forecast (percent of gross domestic product)



Note: The general government deficit is defined as the fiscal position of central, state, and local governments after accounting for capital expenditures. Forecasts start after 2019 for Canada, China, France, Germany, Italy, United Kingdom, and United States. Forecasts start after 2018 for Japan. Negative values indicate surplus.

Sources: International Monetary Fund World Economic Outlook Database, October 2020, Office of Financial Research

0.6 percent per month, for an annualized rate of 7 percent.²⁰ As the size of fiscal programs increase, the growing federal debt could remain a long-term risk. On the other hand, many households and businesses may be unable to recover absent additional government support.

UNCERTAINTY PREVAILS

Uncertainty amplifies both economic and financial system shocks. Studies that link uncertainty to weaker economic growth emphasize

two channels through which uncertainty affects business decisions. First, uncertainty motivates corporations to delay investment and hiring as they wait for more information before starting projects with lower marginal returns or high sunk costs.²¹ Second, uncertainty regarding the success of a corporate venture tends to increase the cost of financing because banks and debt investors demand a higher return for the additional risk associated with such ventures.²² Firms might not invest in

otherwise profitable and welfare-improving projects due to the increased cost of financing.

The spread of the COVID-19 pandemic to the United States and the shutdown of the U.S. economy in March was a shock so severe that the effects exceeded the extremely adverse scenario used in the Federal Reserve's bank stress tests.²³ Due to the novelty of the virus, the unknowns of its course and the response of health policy, many businesses are unsure when

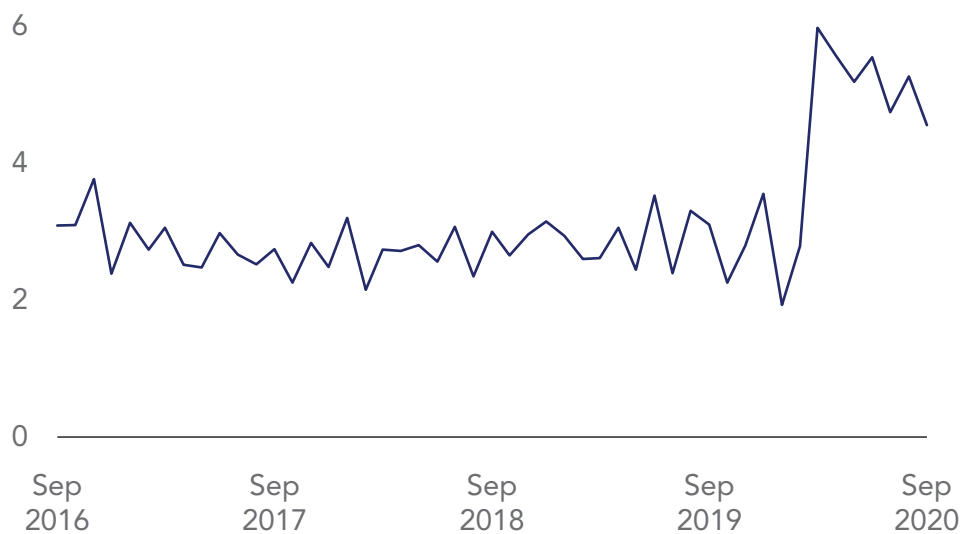
or even if they will resume normal operations and what new safeguards they must erect. Considerations like these have contributed to an environment of high uncertainty for businesses (see **Figure 18**).

Because uncertainty remains high about the pandemic's course, as well as the pace and efficiency of business reopenings, the range of plausible future outcomes may be wide. Such uncertainty can weigh heavily on economic activity.

CREDIT RISK

The risk that numerous borrowers or counterparties might not meet their financial obligations remains elevated. The financial effects of the COVID-19 pandemic and recession have moved through businesses, households, and all levels of government. Direct government payments to households and businesses have partially mitigated default risk. Banks tightened lending standards for all loan types in the first and second quarters.²⁴ While this reaction can be expected, the resulting reduction in loan availability could hinder economic recovery.

Figure 18. Business Uncertainty Rose with the Pandemic (index)



Note: The Business Uncertainty index is based on Altig, Barrero, Bloom, Davis, Meyer, and Parker (2020). This index reflects a survey of firms' uncertainty as measured by the sales-weighted average standard deviation of the probability distributions of each of the firms' own next-four-quarter sales expectations.

Sources: Altig and others (2020), Atlanta Fed/Chicago Booth/Stanford Survey of Business Uncertainty, Office of Financial Research

U.S. corporate leverage was already high entering into 2020, especially among companies with credit ratings below investment grade. Those same companies may now face operating challenges as the ability to service debt or take on additional debt declines.

As has been the case in past financial crises, commercial real estate (CRE) is expected to be a prime source of potential credit problems. Changes in business models and consumer behavior, such as continuing to work at home for fear of infection in the office or on a

commute, add to this year's stress and uncertainty about the severity of potential losses.

Household credit risk, in contrast, was relatively low at the beginning of the year. This risk has risen along with record unemployment and growing numbers of business bankruptcies. Even with forbearance on mortgages and other bills, continued uncertainty about the pace of job recovery can increase vulnerabilities to the ability of households to keep up with loan payments. The delinquency rate on one-to-four family mortgages rose

to a seasonally adjusted 8.22 percent at the end of second quarter 2020, up 3.86 percentage points from first quarter 2020 and 3.69 percentage points from a year earlier.²⁵

State and local governments have seen sharp drops in revenue, while needs for resources to cope with the pandemic have increased. As a result, default risk has risen for some municipal bonds, especially those backed by revenue streams from projects such as transit systems and convention centers.

Internationally, the global pandemic increased stress on some foreign government debt. Argentina defaulted on its debt in May, its ninth sovereign default. Several other countries, including some large ones such as Italy, have seen default risks rise. International support through organizations such as the International Monetary Fund may provide support for sovereign debt crises.

NONFINANCIAL CORPORATE CREDIT

High corporate leverage has been encouraged by

years of exceptionally low interest rates and strong investor appetite for yield. The COVID-19 pandemic came as a severe shock. The policy response in March ensured that many corporations were able to obtain funding via capital markets. However, defaults and downgrades can still threaten market stability and the solvency of some lenders with loan portfolios concentrated in troubled sectors. Implications differ between investment-grade debt and non-investment grade debt, also known as high-yield or junk debt. By definition, high-yield debt has a higher probability of default, as reflected in lower credit ratings. Implications also vary by business sector within those two categories. That is, some sectors are more highly leveraged and exposed to the economic shutdown that accompanied the pandemic.

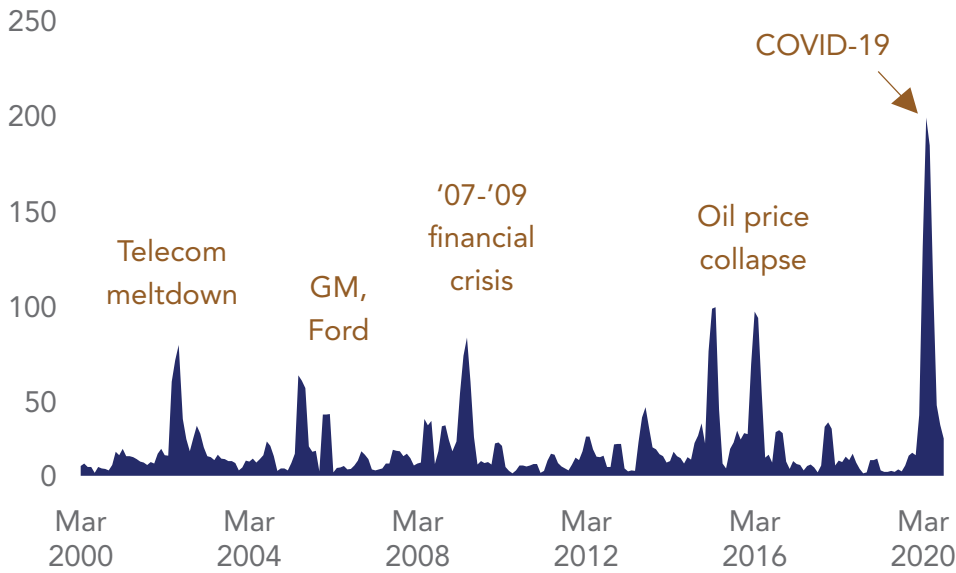
Investment-grade debt.

The primary financial stability risk from investment-grade debt is credit rating downgrades to high-yield status, or so-called fallen angels. As of September, \$3.0 trillion of the \$5.2 trillion in investment-grade corporate bonds in the ICE BofA

U.S. nonfinancial index was rated BBB, the lowest rated category within investment grade. Within BBB, \$824 billion, or 27 percent, was rated BBB- (just one notch above high yield). This cohort is most susceptible to downgrades to high yield. A wave of downgrades could disrupt financial markets because some pension funds and other institutional investors have strict mandates to hold only investment-grade rated securities. These investors could be incentivized to sell debt downgraded to below investment grade.

To date, however, credit markets have absorbed the record level of fallen angel debt (see **Figure 19**). As of September, fallen angels (issues removed from the ICE BofA U.S. corporate index) totaled \$250 billion, significantly exceeding annual levels over all prior years. Of this total, \$170 billion transitioned into the high-yield index (some fallen angels are not eligible for inclusion in the U.S. high-yield index), representing 14 percent of the index's face value as of the end of 2019. In comparison, from 2011 through 2019, fallen angel debt (trailing 12 months)

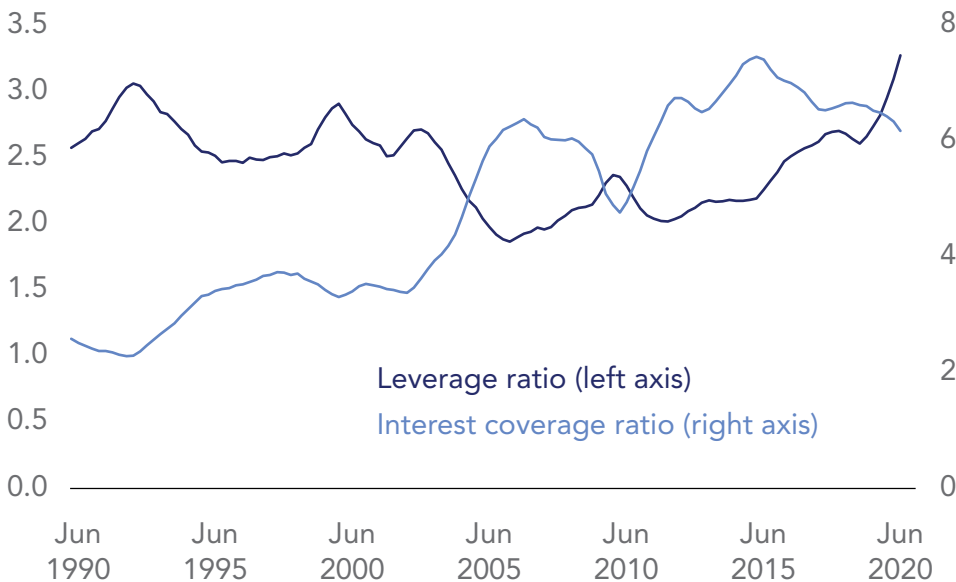
Figure 19. Fallen Angel Debt (\$ billions, trailing three-month total)



Note: Includes financial issuers. Fallen angels are issuers downgraded from investment grade to high yield; fallen angels above refer to issuers previously included in the BofA U.S. Corporate Index (COA0).

Sources: BofA Global Research, ICE Data Services, Office of Financial Research

Figure 20. Median Leverage and Interest Coverage for BBB-rated Companies (ratios)



Note: Data as of June 30, 2020. Leverage is defined as gross debt-to-EBITDA (earnings before interest, taxes, depreciation, and amortization). Coverage is defined as EBIT-to-interest expense. Ratios are four-quarter moving averages.

Sources: Compustat, Office of Financial Research

averaged 3 percent of the face value of the high-yield index.

Before the COVID-19 crisis, BBB-rated companies had several effective avenues to boost cash flow for debt service and maintain their investment-grade status. These avenues included asset sales or reductions in dividends, share buybacks, and capital spending. Now, earnings have declined materially for many companies, eroding their ability to service debt. Despite the decline in earnings year to date, investment-grade issuance is at record highs and corporations have drawn from revolving credit facilities. As a result, credit quality has weakened as leverage ratios (gross debt to earnings before interest, taxes, depreciation, and amortization (EBITDA)) have risen and interest coverage ratios (earnings before interest and taxes (EBIT) to interest expense) have declined (see **Figure 20**).

Non-investment grade debt. Key concerns for high-yield and unrated companies are whether they are able to refinance debt or service existing debt. To date, an increasing number of companies

have been unable to adequately service their debt obligations, which triggered a rise in defaults and bankruptcies. Defaults, in turn, could lead to credit losses for bank and nonbank lenders. Those lenders with insufficient loss-absorbing capacity would need to sell assets or raise capital to maintain solvency. Federal Reserve lending programs are largely targeted at investment-grade companies, but also include certain high-yield firms.

The U.S. leveraged finance market, including high-yield bonds and leveraged loans, was \$3.6 trillion in size in 2019, or almost 31 percent of nonfinancial corporate debt.²⁶ Many of these borrowers are either not covered by government lending programs — for example, because of poor credit quality — or coverage is insufficient relative to financing needs.

In March, credit spreads rose rapidly to distressed levels, issuance of new high-yield debt froze, and secondary market liquidity deteriorated. After the Federal Reserve introduced its market support programs on March 23 and the CARES Act

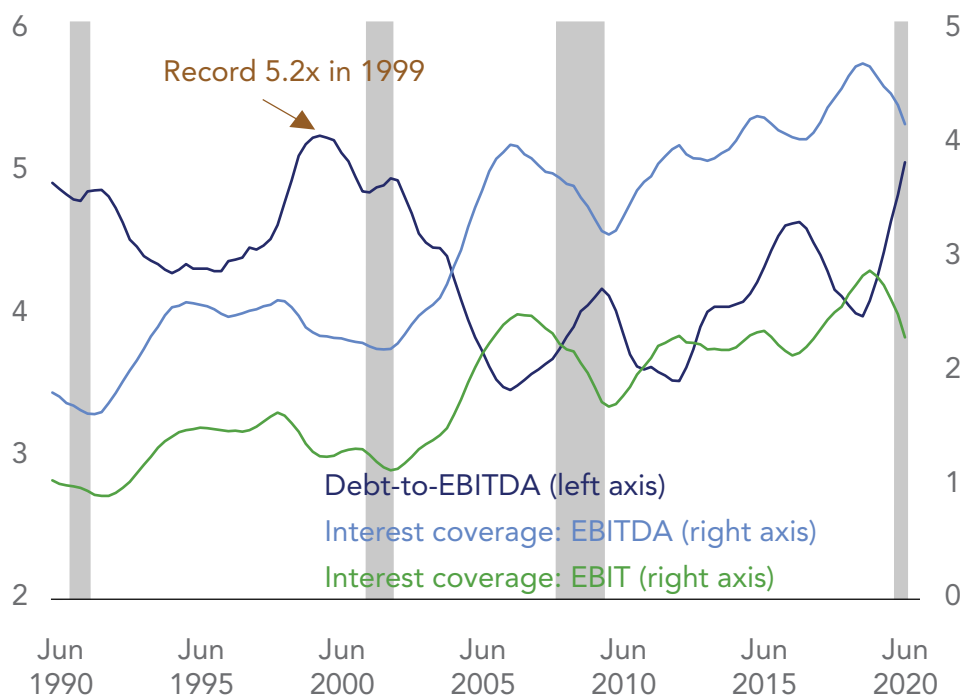
became law on March 27, market sentiment improved dramatically. The perceived risk of a disruption to credit availability is substantially lower. However, businesses with unsustainable business models and high debt burdens may have trouble refinancing existing debt, as evidenced by the recent increase in bankruptcy filings.

Leverage ratios are likely to exceed the 1999 all-time median peak of 5.2 times EBITDA this year given the

sharp decline in earnings (see **Figure 21**). The ability of firms to make interest payments on their debt has remained robust due to low interest rates, but interest coverage ratios are falling as earnings decline.

Credit spreads reflect the stress in borrowing markets. During March, the index-level high-yield corporate bond spread increased from below average to more than 1,000 basis points. Spreads exceeding 1,000 basis points, or 10 percent,

Figure 21. Median Leverage and Interest Coverage for High-yield Companies (ratios)



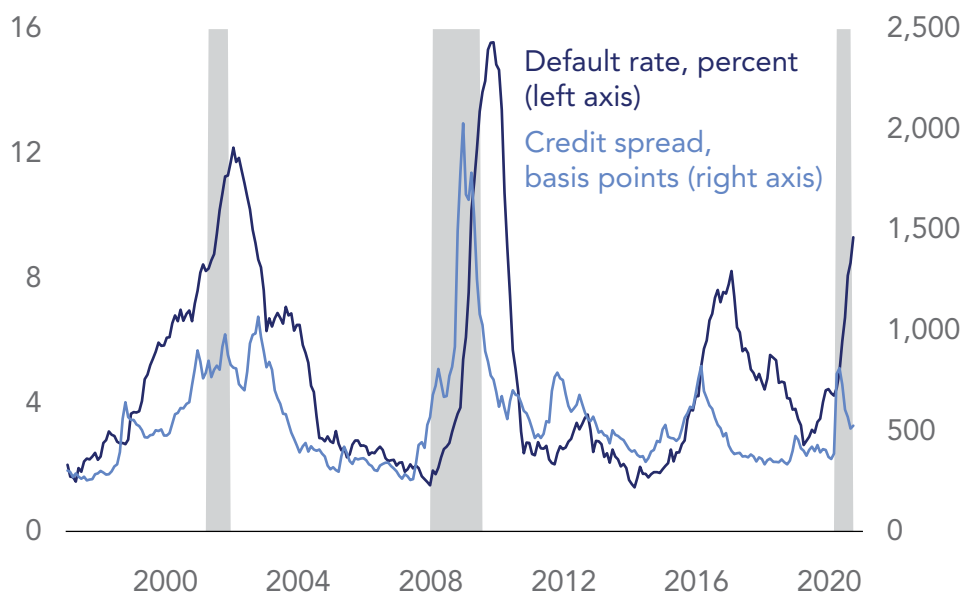
Note: Data as of June 30, 2020. Shaded areas are U.S. recessions. Leverage is gross debt-to-EBITDA (earnings before interest, taxes, depreciation, and amortization). Coverage is EBITDA and EBIT divided by interest expense. Leverage and coverage are four-quarter moving averages of the median.

Sources: Compustat, Haver Analytics, Office of Financial Research

are generally associated with distress by market participants. Historically, very sharp increases in spreads precede higher defaults and economic recessions (see **Figure 22**).

Lower-rated non-investment grade issuers are at higher risk of default. Corporate bonds rated the equivalent of B- and lower totaled \$303 billion, or 23 percent of the ICE BofAML U.S. high-yield nonfinancial index as of September. Institutional leveraged loans rated B- and lower totaled almost \$392 billion, or 32 percent of the S&P/LSTA Leveraged Loan Index. Thus, across bonds and loans, debt rated B- or lower approaches \$700 billion. However, this estimate may understate the total debt at risk because it excludes pro rata leveraged loans and leveraged loans originated by private debt funds and business development companies. Assessing the amount of debt at risk in these segments is difficult due to data limitations. As highlighted in the OFR's 2019 Annual Report, bank-held leveraged loans and middle-market leveraged loans, the latter of which are originated by private

Figure 22. U.S. Corporate Bond High-yield Default Rate vs. Credit Spread (percent, basis points)



Note: Shaded areas are U.S. recessions. Credit spread is monthly average (daily peak exceeded 1,000 basis points in March). Defaults reflect high-yield bonds (excludes loans).

Sources: Moody's Investors Service, Haver Analytics, Office of Financial Research

debt funds and business development companies, in aggregate are larger than the \$1.2 trillion institutional leveraged loan market. Some corporate borrowers benefit from the Federal Reserve's Main Street lending facilities, but many highly leveraged borrowers are not eligible. These borrowers face higher default risk or much higher financing costs. Further, adding new debt onto the already highly leveraged balance sheets of these companies is not a viable strategy. Some of these companies may need new equity capital to survive.

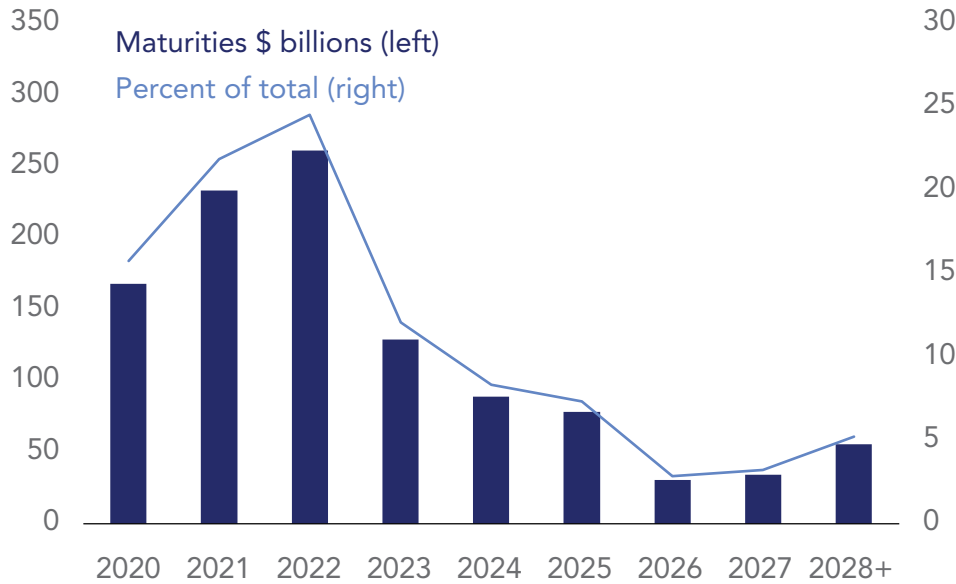
Default risk is higher for highly leveraged companies that need to roll over maturing debt. Heading into the crisis, high-yield bonds maturing in 2020 through 2022 totaled \$630 billion, or 59 percent of total high-yield bonds outstanding (see **Figure 23**). The maturity wall for leveraged loans was not as steep. Only 8 percent of these loans mature over the same period. However, if borrowers default on interest payments or if they trip cross-default provisions, creditors could accelerate debt repayments. Maturity walls have shifted since the

spring, as many companies refinanced debt, pushing out maturities.

This default cycle will encompass a much broader range of industries than during 2015-16, when defaults were concentrated

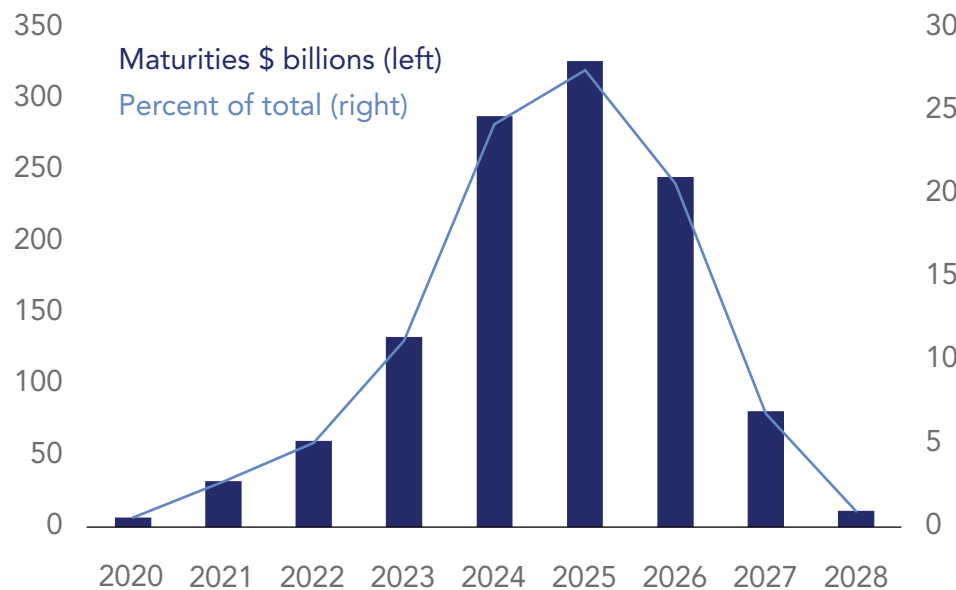
in the oil and gas and the metals and mining industries. As of second quarter 2020, every sector had a higher share of firms with very high leverage as compared with the median share since 1990 (see **Figure 24**). Very high leverage is associated with debt levels that exceed six times EBITDA. Similarly, the share of companies with low interest coverage ratios is high (see **Figure 25**). Interest coverage ratios below 1, meaning interest expenses are more than EBIT for the same period, are considered unsustainable over the long term. The share of companies in this cohort will increase because coverage ratios are likely to deteriorate further.

Figure 23. Maturities by Year for High-yield Bonds (top) and Leveraged Loans (bottom) (\$ billions, percent)



Note: Maturities as of March 2020.

Sources: Dealogic, Office of Financial Research

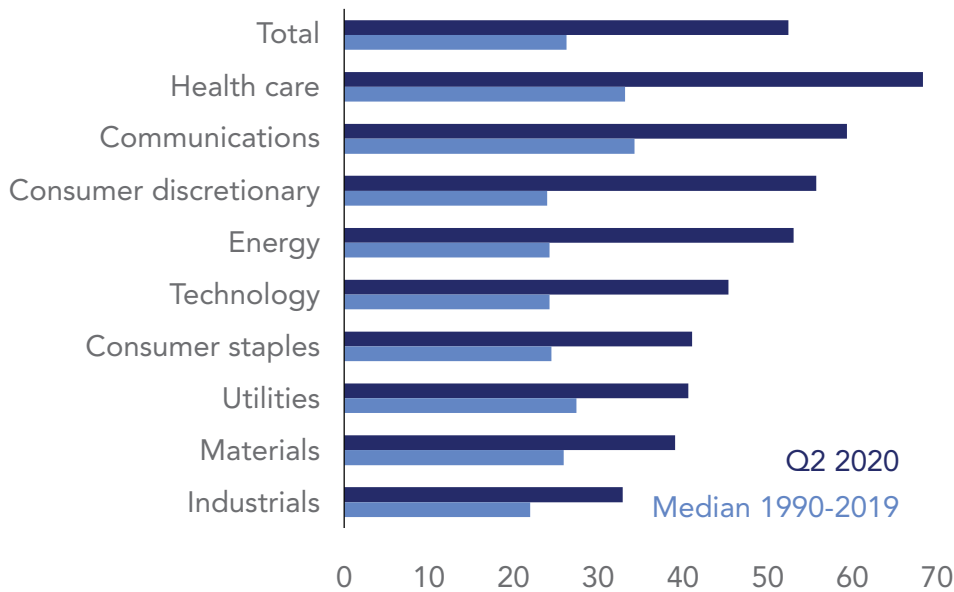


Note: Maturities as of March 2020. Includes financial sectors (6 percent of outstanding loans).

Sources: S&P Leveraged Commentary and Data, Office of Financial Research

Corporate defaults have risen in 2020 as lower-quality borrowers struggle to meet their financial obligations. Through August, corporate defaults on U.S. bonds and loans totaled \$134 billion, the highest year-to-date total since 2009 (see **Figure 26**). The trailing 12-month default rate for high-yield bonds and loans stood at 8.4 percent in August, up from 4.5 percent in February.²⁷ For comparison,

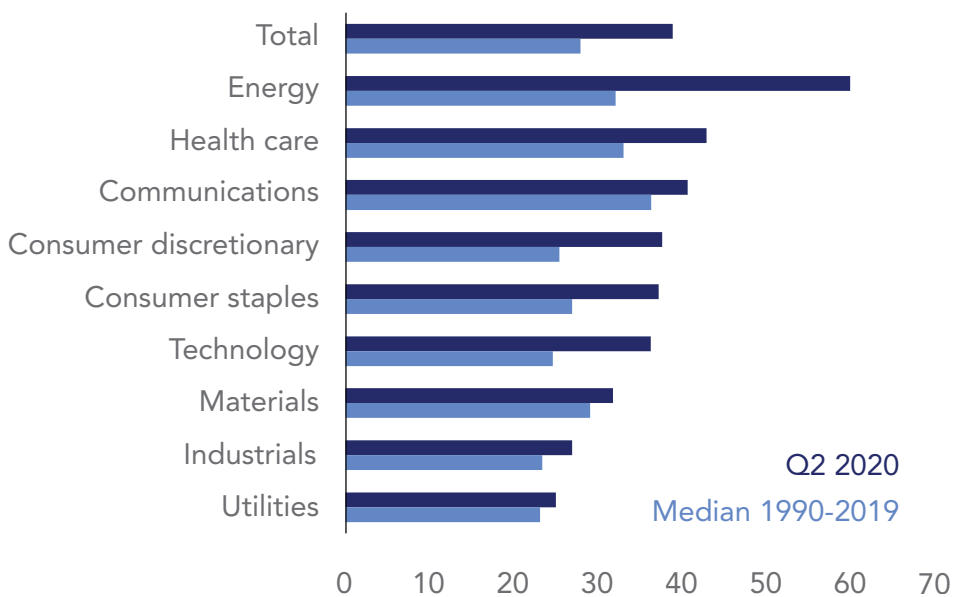
Figure 24. Firms with Leverage Ratios Exceeding 6x (percent of firms in sector)



Note: Data as of June 30, 2020. Includes high-yield and unrated firms. Leverage is gross debt-to-EBITDA (earnings before interest, taxes, depreciation, and amortization).

Sources: Compustat, Office of Financial Research

Figure 25. Firms with Interest Coverage Below 1x (percent of firms in sector)



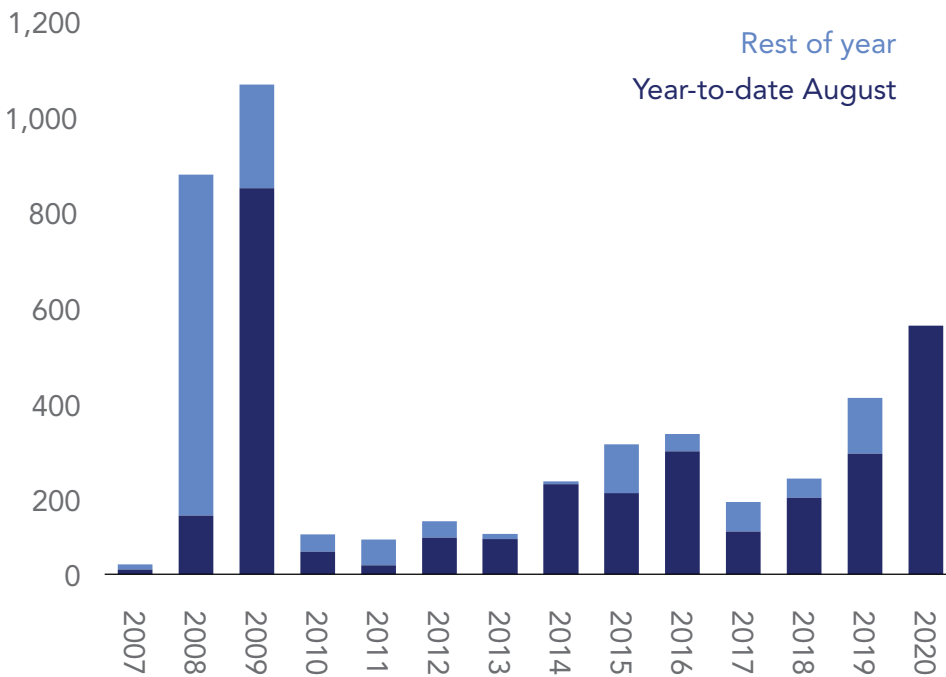
Note: Data as of June 30, 2020. Includes high-yield and unrated firms. Interest coverage is earnings before interest and taxes (EBIT) divided by interest expense.

Sources: Compustat, Office of Financial Research

the default rate average for the high-yield sector since 1987 is 4.7 percent, with a peak default rate of 14.7 percent in 2009. Moody's Investors Service estimates that default rates will reach double digits in several industries, including automotive; business services; consumer goods; consumer services; hotel; gaming and leisure; and wholesale.²⁸ In total, Moody's forecasts that defaults will reach 11.4 percent in the first quarter of 2021.²⁹

As default rates rise, the number of bankruptcies will rise, too. Through September, Chapter 11 bankruptcy filings by businesses exceed 5,500, up from approximately 4,150 for the comparable period a year earlier.³⁰ However, part of the increase may be due to a change in the law in February making it easier for small companies to file for Chapter 11. Annual Chapter 11 filings exceeded 13,600 in 2009 during the depths of the previous financial crisis. There are at least two key concerns with regard to a large wave of bankruptcy filings. First, this could overwhelm the bankruptcy system, resulting in congested courts and an

Figure 26. U.S. Corporate Bond and Loan Defaults (\$ billions)



Note: Data for 2020 as of August 31. Includes financial sectors.

Sources: Moody's Investors Service, Office of Financial Research

inability of filers to obtain critical debtor-in-possession financing.³¹ Second, many of these Chapter 11 reorganizations may ultimately become business liquidations. Liquidations could result in larger realized losses for creditors. Liquidations could also have a greater negative impact on the economy via layoffs and reductions in capital spending at the businesses being liquidated. Large losses by creditors would in turn result in a further tightening of financial conditions, constraining credit to higher quality businesses.

Corporate debt issuance.

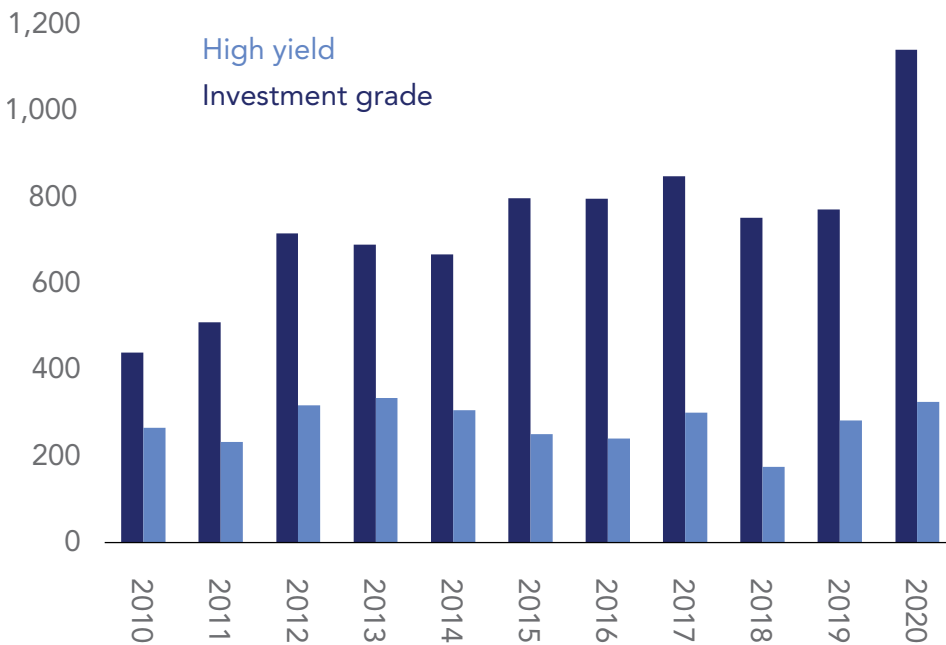
In March, corporate bond and loan issuance stalled. Issuance of corporate bonds rebounded significantly in April following the government interventions introduced in late March and early April. Investment-grade nonfinancial issuance set new monthly records in March (\$195 billion) and April (more than \$230 billion). As of September, year-to-date investment-grade issuance is a record-high \$1.1 trillion (see **Figure 27**). High-yield issuance surged as well as risk sentiment improved. Leveraged loan issuance

has also rebounded from its low point in March. Through September, year-to-date leveraged loan issuance totaled \$300 billion, down 20 percent from the comparable period a year ago. The decline in leveraged loan issuance is in part due to issuers turning to bond markets for funding and to lower merger and acquisition activity. Overall, bond and loan issuance has enabled some firms to pay down revolving credit lines that were drawn on earlier in this crisis, to build cash reserves, or to refinance existing debt (thereby pushing out maturity walls as noted earlier) at lower rates. But in aggregate this borrowing also increases already-high leverage.

Collateralized loan obligations (CLOs).

CLOs are a structured finance product that primarily hold leveraged loans as part of a collateral pool that generates cash flows for investors. At the end of 2019, there were \$686 billion in U.S. CLOs outstanding, up 16 percent from 2018. Following the disruption in the CLO market in March, the issuance of new CLOs declined. At midyear, there

Figure 27. U.S. Nonfinancial Corporate Bond Issuance (\$ billions)



Note: 2020 represents issuance through September. Prior years are full-year issuance. Investment-grade issuance includes preferred shares.

Sources: Dealogic, Office of Financial Research

were \$707 billion in CLOs outstanding.³²

A CLO is divided into tranches, each with a specified right to receive payments resulting from the underlying investments' cash flows. The most senior-rated tranche is initially rated AAA and typically pays a floating interest rate tied to a spread over a reference rate (historically LIBOR, see **Additional Risks**). The AAA-rated debt tranche typically accounts for about 64 percent of a CLO's total capital structure. Investors in the most junior tranche, the equity tranche,

receive payments after all payments have been made to all other tranches. The tranches in between the AA-rated and the below-investment grade "junior" (nonequity) tranches are known as mezzanine tranches. Similar to the most senior-rated tranche, the mezzanine tranches typically pay an interest rate tied to a spread over a reference rate, the same reference rate used for the most senior-rated tranche. The spread reflects the credit risk of the tranche, and each mezzanine tranche can be separately rated. The rating is determined, in part, by

the tranche's position in the capital structure along with the credit quality of the underlying collateral. The CLO manager and contract terms also affect the rating.

CLO investors include banks, insurance companies, investment managers, and pension funds. Ninety-five percent of bank CLO holdings are rated AAA, and CLOs are 5 to 7 percent of bank securities portfolios, on average. However, many smaller banks do not hold any CLOs. AAA-rated CLO tranches have not defaulted in the 30-year history of this product. Insurance companies and others hold varying tranches of the CLO market.

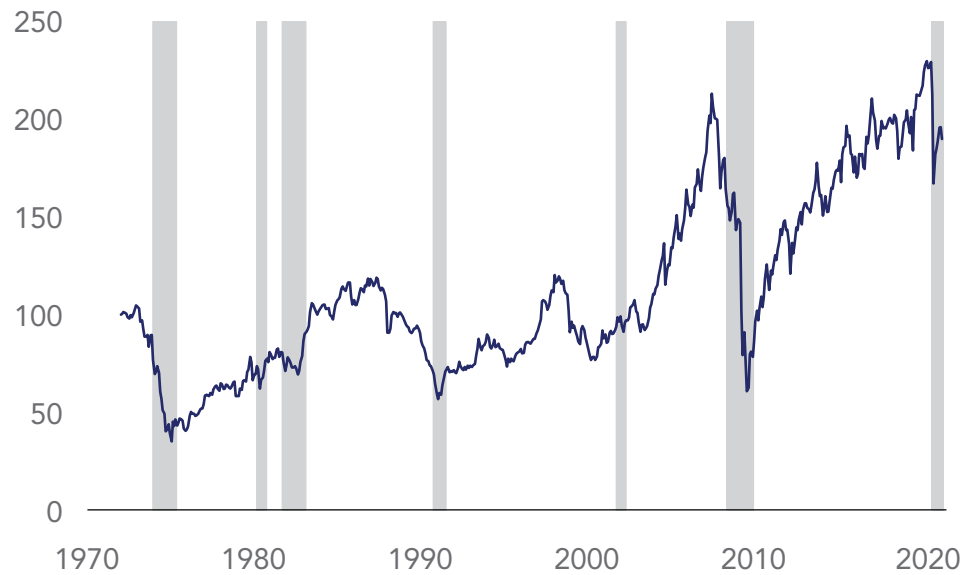
Stress tests by the National Association of Insurance Commissioners and the ratings agencies indicate that the failure of an AAA-rated CLO is unlikely.³³ There is greater risk of default for CLO tranches rated below AAA. For now, other CLO tranches that are rated investment grade have sufficient support to keep making payments despite underlying collateral defaults, losses, and rating downgrades. However, a protracted pandemic and corresponding economic slowdown could affect these

payouts. About 67 percent of CLOs have exposure to industries hit hardest by the pandemic, including the travel and leisure, retail, automotive, oil and gas, and airline industries.

COMMERCIAL REAL ESTATE

The commercial real estate market is often subject to volatile swings during economic cycles (see **Figure 28**). During favorable economic periods as demand for CRE assets increases, rents and market values rise, loan-to-value (LTV) and debt

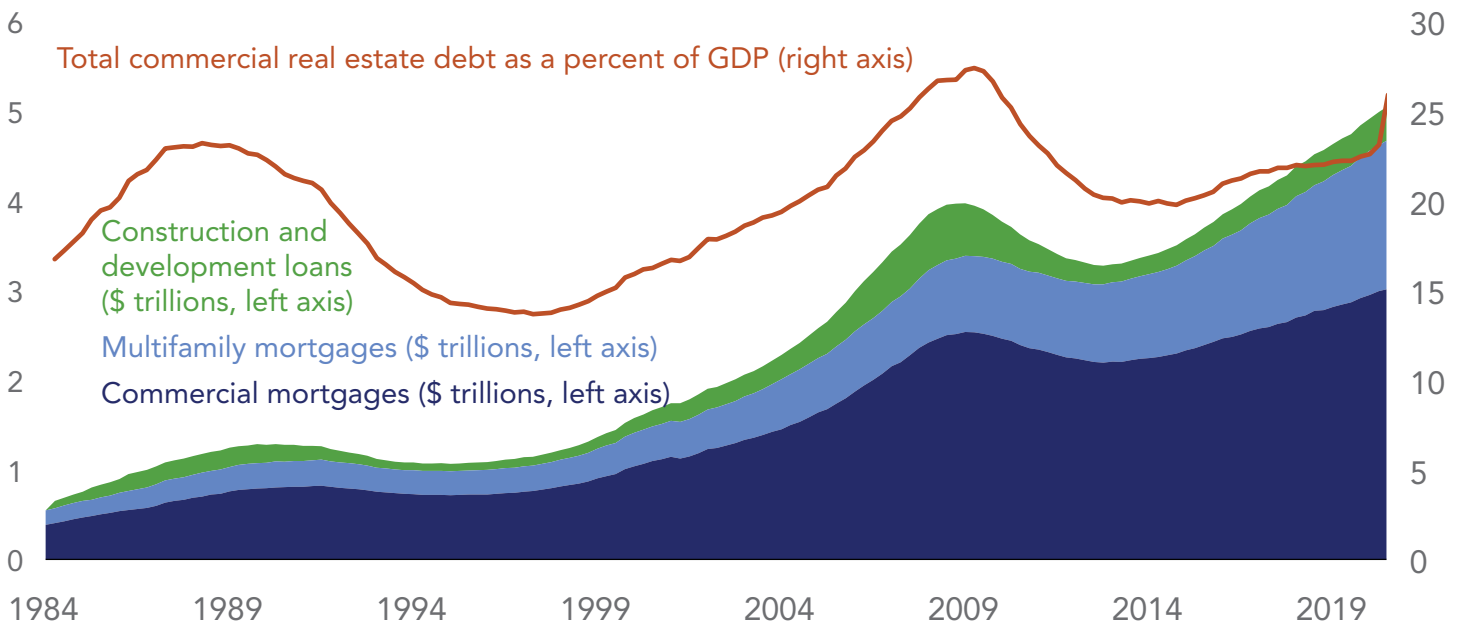
Figure 28. Commercial Real Estate Valuations Swing with Economic Conditions (index)



Note: National Association of Real Estate Investment Trusts Composite Price Index tracks prices of real estate investment trust (REIT) stocks; the index equals 100 in December 1971. Shaded areas indicate U.S. recessions.

Sources: National Association of Real Estate Investment Trusts, Office of Financial Research

Figure 29. Commercial Real Estate Debt as a Percent of Gross Domestic Product (\$ trillions, percent)



Note: Data as of June 30, 2020. Commercial mortgage data as reported on Federal Reserve System's Release Z.1 exclude construction and development (C&D) loans. C&D loans as reported on FDIC Call Reports. Total commercial real estate debt is the sum of the three categories shown.

Sources: Board of Governors of the Federal Reserve System, Federal Deposit Insurance Corporation, Haver Analytics, Office of Financial Research

service coverage ratios look strong, default rates and credit losses are low, and debt increases. During unfavorable economic periods such as the current COVID-19 driven downturn, the reverse is typically true. In many cases, rents and market values decline, and LTV and debt service ratios rapidly reach levels where risk of loan defaults rise, often resulting in large losses. This high degree of economic sensitivity is increasingly important as CRE debt rises from its low after the 2007-09 financial crisis (see **Figure 29**).

CRE leverage exacerbates the cyclical sensitivity. CRE leverage can be secured, such as a mortgage on a specific property, or unsecured, such as a bond issued by a real estate investment trust (REIT). By making the loan, the lender, possibly leveraged itself, indirectly assumes downside risk similar to that assumed by the property owner.

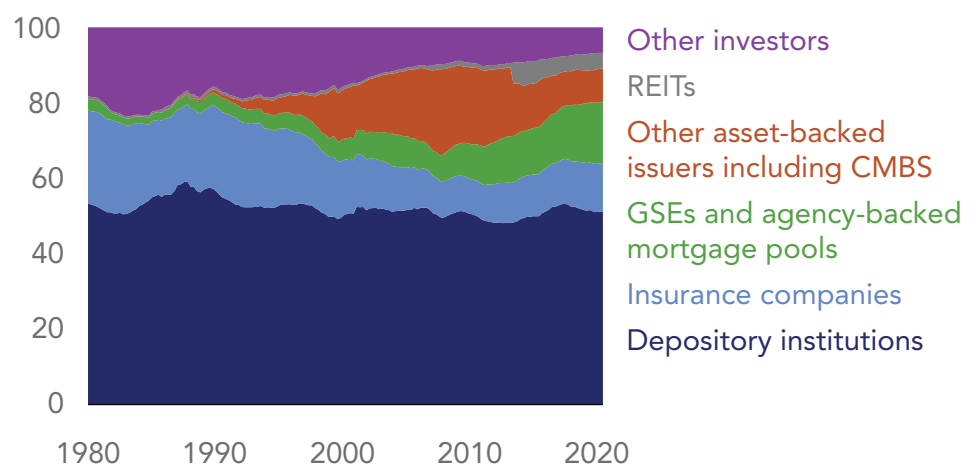
Lenders. Much CRE funding is supplied by regulated financial institutions, particularly banks, other depository institutions, and insurers. Banks and other depository institutions have historically extended the largest share of CRE loans,

holding half of the debt outstanding (see **Figure 30**). CRE represents 22.4 percent of the banking industry's loans and leases, with the highest share among banks with \$1 billion to \$10 billion in assets (see **Figure 31**).

CRE credit problems have been a major cause of depository institution failures. Between 1980 and 1993, the concentrations of CRE loans relative to total assets were higher for banks that subsequently failed than for surviving banks. For failed banks, CRE loans rose from 6 percent to almost 30 percent of total assets over 1980-93.

Among the other banks, CRE loans rose from 6 percent to 11 percent.³⁴ At the time, large banks were significant CRE lenders. The Government Accountability Office in 2013 reported that from 2008 to 2011, failures of small and medium-size banks were largely associated with high concentrations of commercial property loans.³⁵ The scale of bank CRE losses and their impact has moderated due to improved capital positions and increased asset diversification, but bank losses due to high CRE exposures will likely continue to be a concern.

Figure 30. Funders of Outstanding Commercial Real Estate Debt (percent)



Note: Data as of June 30, 2020. REIT stands for real estate investment trust. CMBS stands for commercial mortgage-backed securities. GSE stands for government-sponsored enterprise. Excludes construction and development loans held by banks. Other investors include pension plans, finance companies, households, and nonfinancial businesses.

Sources: Board of Governors of the Federal Reserve System, Haver Analytics, Office of Financial Research

Figure 31. Bank Exposure to Commercial Real Estate by Real Estate Type (\$ billions, percent)

Institution size by total assets	More than \$250 billion	\$10 billion to \$250 billion	\$1 billion to \$10 billion	Less than \$1 billion	Total
Total CRE loans (\$ billions)	629	965	595	277	2,466
Total CRE loans as % of gross loans and leases	12.7	25.1	42.1	36.0	22.4
U.S. CRE loans (\$ billions)	566	963	595	277	2,400
U.S. CRE loans as % of gross loans and leases	11.4	25.0	42.0	36.0	21.8
Construction and development loans as % of U.S. CRE loans	14.4	15.8	16.4	17.9	15.9
Multifamily loans as % of U.S. CRE loans	24.6	21.3	17.1	10.4	19.7
Nonresidential loans as % of U.S. CRE loans	61.1	62.9	66.6	71.7	64.4

Note: Data as of June 30, 2020. CRE is commercial real estate. Total loans include loans to U.S. and foreign borrowers.

Sources: Federal Deposit Insurance Corporation, S&P Global Market Intelligence, Office of Financial Research

Community banks generally have large CRE exposures and less diversified lending portfolios (see **Figure 32**). Community banks heavily exposed to CRE lending may be at higher risk of failure when the real estate cycle turns negative, especially lenders exposed to higher-risk CRE loan segments such as land or development loans, or higher-risk properties such as lodging (see **Figures 33** and **34**). Bank CRE loan defaults may not peak until late 2020 or early 2021,

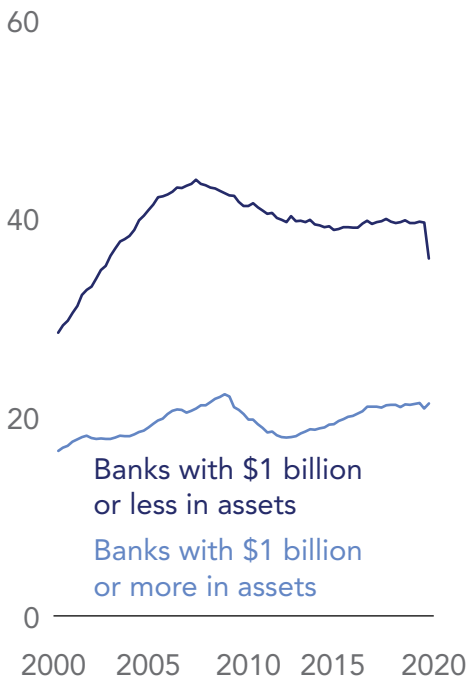
according to real estate analytics firm Trepp LLC.

Government-sponsored enterprises (GSEs), principally Fannie Mae and Freddie Mac, are the second largest funders at 16.5 percent of the market (see **Figure 30**). Fannie Mae and Freddie Mac fund only one relatively stable CRE asset class, multifamily housing. Further, the enterprises benefit from federal government support, allowing them to continue to issue mortgage-backed

securities (MBS) and debt during periods of financial stress.

Insurers, especially large life insurers, are another leading CRE lender, with 12.7 percent of the market (see **Figure 30**). Insurers have been lending on CRE for decades and benefit from extensive lending experience. Insurers include some of the most conservative CRE lenders. They require low LTV and high debt service coverage ratios.³⁶ Because of their

Figure 32. Smaller Banks Have More CRE Loans Relative to Total Loans and Leases (percent)

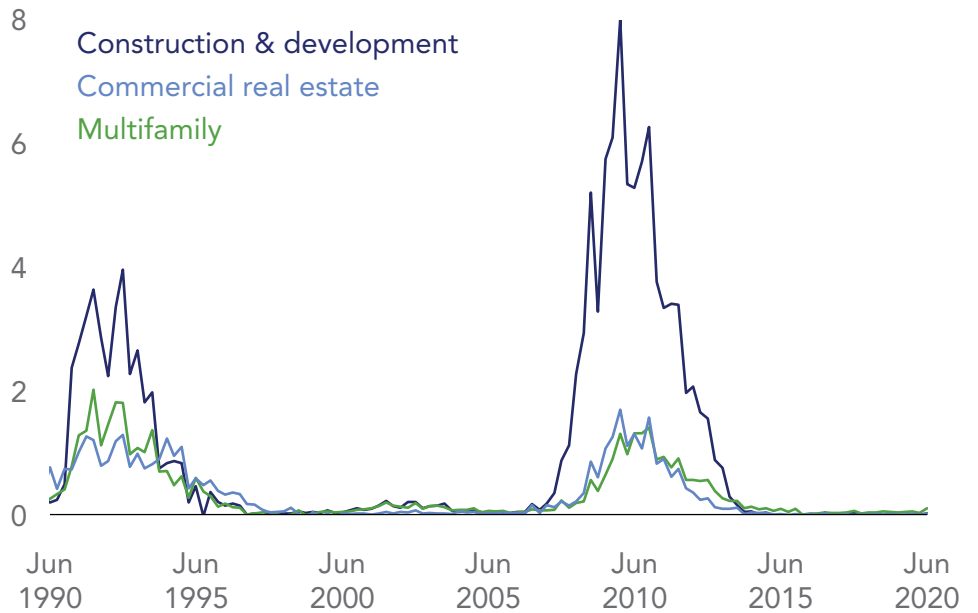


Note: Data as of June 30, 2020. CRE stands for commercial real estate. CRE includes nonresidential, construction and development, multifamily, and foreign real estate loans.

Sources: Federal Deposit Insurance Corporation, Haver Analytics, Office of Financial Research

conservative lending, insurers have benefited from relatively favorable credit performance on their CRE lending in past stress periods.³⁷ This will likely be the case for the current credit cycle. Insurers own a wide range of debt backed by CRE, with commercial mortgage-backed securities (CMBS) being the largest portion at 31 percent, and multifamily and office both around 17 percent (see

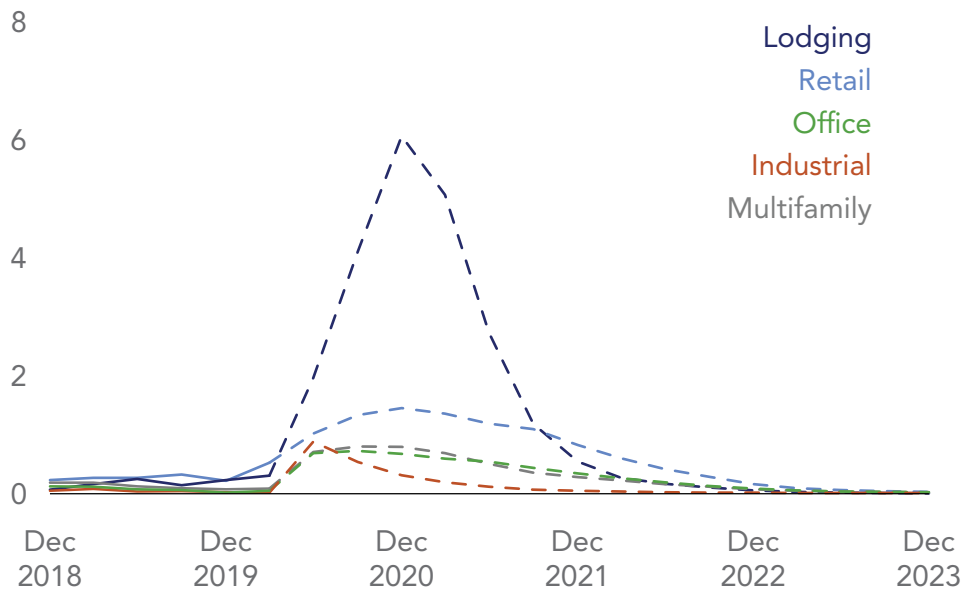
Figure 33. Bank Charge-off Rate by Loan Type (percent)



Note: Data as of June 30, 2020. The charge-off rate is realized loan losses as a percent of total loans. The figure shows the net charge-off rate, which subtracts recoveries on written-down loans from gross charge-offs.

Sources: Moody's Analytics REIS, Federal Deposit Insurance Corporation, Office of Financial Research

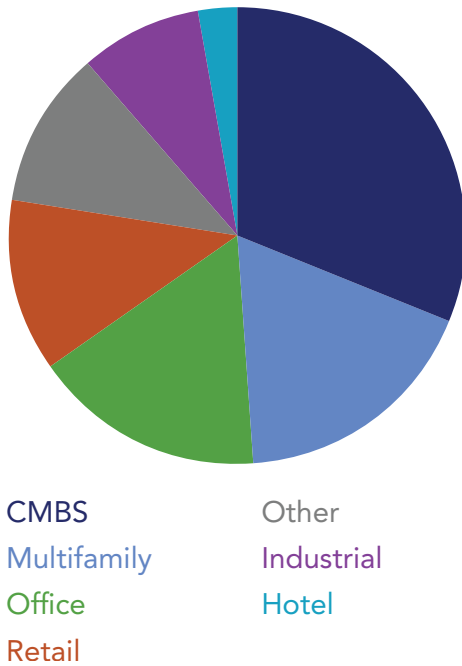
Figure 34. Forecasted Bank Loan Default Rates by Property Type (percent)



Note: Data through March 2020 are actual; dashed are projected.

Sources: Trepp LLC, Office of Financial Research

Figure 35. Insurers' CMBS and Commercial Real Estate Loans by Asset Type



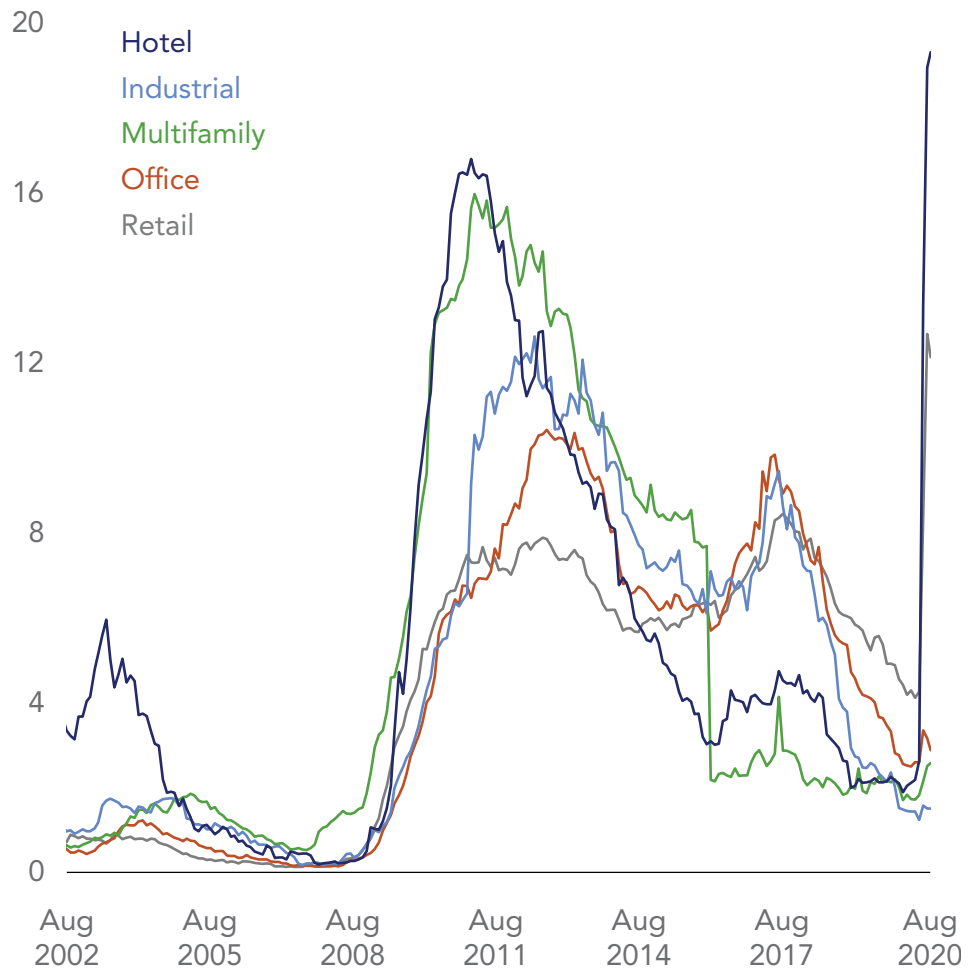
Note: Data as of Dec. 31, 2019. CMBS stands for commercial mortgage-backed securities.

Sources: S&P Global Market Intelligence, A. M. Best, Office of Financial Research

Figure 35). Insurers are relatively less exposed to the hard-hit retail and hotel properties because of the perceived higher risk in those sectors even before the pandemic.

CMBS, with a 8.8 percent market share, are an important part of the CRE financing landscape (see **Figure 30**). Banks and insurers also hold CMBS in their investment portfolios in addition to their ownership of direct loans. CMBS investments at highest risk

Figure 36. Commercial Mortgage-backed Securities 60+ Day Delinquency Rate (percent)



Note: Data as of August 2020. Moody's conduit DQT defines delinquent loans as loans that are 60 or more days in payment arrears; performing matured; nonperforming matured; foreclosure in progress; or real estate owned.

Sources: Moody's Investors Service, Office of Financial Research

of principal losses are those backed largely or exclusively by higher-risk properties, such as hotels and shopping malls (see **Figure 36**).³⁸

Loans included in CMBS are subject to a more complex forbearance approval process when a loan becomes troubled than are loans held by others.³⁹

During good economic times, these CMBS forbearance complexities matter little. However, in times of market stress such as now, these forbearance complexities can result in elevated levels of loan defaults and credit losses by CMBS borrowers compared with loans made with more flexibility.

Direct lenders unaffiliated with regulated financial institution can lend aggressively, offering loans with more attractive borrower features such as higher LTV ratios.⁴⁰ These lenders seek higher returns and assume greater credit risk. Given the higher risk profile of these loans, credit losses by direct lenders are likely to exceed those of the more conservative lenders.

Asset types. Major CRE asset types are office buildings, multifamily housing, retail, hotels, and industrial properties. The sector also includes specialized real estate such as senior housing, student housing, medical, and multiple-use facilities.

Through July, office rental payment collection rates were 96.4 percent.⁴¹ However, over the long run, there remains uncertainty regarding the demand for office space given conflicting space demand trends. This could both reduce rental collection rates on rented space and result in considerable amounts of newly vacant space not bring in rent. The work-from-home movement may reduce office space needs, while remaining office-based employees

may need additional space. A key unknown for office space is how demand will fare in large, high-rise markets dependent upon public transit, such as Manhattan, Washington, Boston, San Francisco, and Chicago. More automobile-oriented cities such as Los Angeles, Dallas, and Houston may be less affected by this challenge.

Industrial space has performed well in the crisis, with an extraordinarily high July rental payment rate of 99.4 percent.⁴² Industrial space can be used for many purposes. Increasingly, Internet commerce warehouses are replacing retail, generating rapidly growing demand for well-located warehouse space.⁴³ Demand is strong enough that additional warehouse space is being developed even during the current crisis, and underperforming retail is being transitioned into warehouse space.

Multifamily properties as a whole have performed relatively well in large part due to extensive federal financial support, such as expanded unemployment insurance. However, considerable uncertainty remains over the long run related to future

employment rates and personal income. Sectors most at risk are low-rent workforce housing where tenants are subject to layoffs and associated reduced income, and high-end urban housing in the most expensive areas such as Manhattan and San Francisco. Sectors benefiting in the future could include suburban apartments in large metropolitan areas and apartments in rapidly growing mid-size urban areas.

The retail CRE sector has been weak for years. The onset of COVID-19 sped the deterioration. Coresight Research reports that retailers announced more than 9,800 stores closed in 2019 and that the 2020 pace will be much higher, with numerous chains filing for bankruptcy protection (see **Figure 37**).⁴⁴ The United States has far more retail space than its peers, and far more than is currently needed.⁴⁵ Shopping malls are hard hit, as their mainstay department stores rapidly fail. Experience-oriented uses of mall space, such as fitness facilities, entertainment venues, and restaurants, have been

affected by COVID-19 restrictions on gatherings. Many shopping malls may close permanently. Small local shopping areas are also under pressure as consumers migrate to online shopping and venture out of their homes less. Credit losses in the retail sector have been and may continue to be substantial. The CMBS retail delinquency rate was 18.1 percent for the month ending June 2020.⁴⁶ Many of these delinquencies may eventually become credit losses.

Hotels have historically been a higher-volatility asset class. This downturn is no exception. Travel, conventions, corporate gatherings, and large social events were cancelled, bringing unprecedented disruption. Hotels have been operating at record low occupancy, with an average September 2020 occupancy rate of 48.3 percent, down from 67.4 percent in September 2019.⁴⁷ The most affected hotels are those that host conventions, are in major downtowns, or are in locations that can be reached only by plane. Hotels performing better are extended stay

Figure 37. Selected 2020 Retail Bankruptcy Filings (\$ millions)

Retailer	Date	Liability Range
Century 21 Dept. Stores	Sep. 10	\$100 to \$500
Stein Mart	Aug. 12	\$500 to \$1,000
Lord & Taylor	Aug. 2	\$100 to \$500
Tailored Brands	Aug. 2	\$1,000 to \$10,000
Ascena Retail Group	July 23	\$10,000 to \$50,000
RTW Retailwinds	July 13	\$100 to \$500
Muji USA	July 10	\$50 to \$100
Sur La Table	July 8	\$100 to \$500
Brooks Brothers	July 8	\$500 to \$1,000
Lucky Brand	July 3	\$100 to \$500
GNC Holdings	June 23	\$500 to \$1,000
J. C. Penney Co.	May 15	\$1,000 to \$10,000
Stage Stores	May 10	\$1,000 to \$10,000
Neiman Marcus	May 7	\$1,000 to \$10,000
J. Crew	May 4	\$1,000 to \$10,000
Bluestem Brands	March 9	\$500 to \$1,000
Art Van Furniture	March 8	\$100 to \$500
Pier 1	Feb. 17	\$500 to \$1,000

Note: Liability ranges are provided in bankruptcy filings.

Sources: New Generation Research, Office of Financial Research.

properties suitable for longer-term residence, those that are lower cost, and those in vacation areas reachable by automobile.⁴⁸

The most aggressive and CRE-exposed lenders, typically private debt investment funds, will likely absorb substantial credit losses in this cycle.

HOUSEHOLD CREDIT

The COVID-19 pandemic introduced an extreme economic shock to households, although household balance sheets have not experienced as much stress as some feared at the onset of the crisis. Household debt balances contracted 0.5 percentage points in April. Growth in debt balances has been

tepid since then due, in part, to tighter lending standards. Public and private relief measures have helped buttress household balance sheets so far, but these relief measures will eventually be phased out.

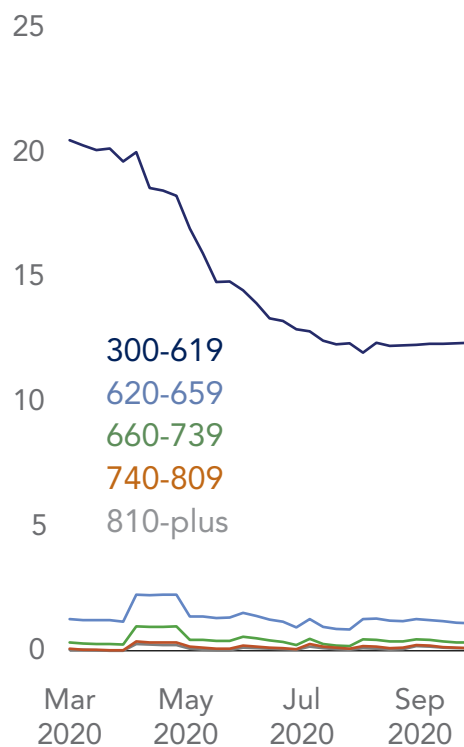
Overall delinquency rates declined from 2.9 percent in January to 1.5 percent in September. The decline was largest for households with the weakest credit profiles, that is, those with credit scores under 620 (see **Figure 38**). This downward trend in delinquencies is unusual for a recession.

Typically, delinquencies rise sharply. Unprecedented policy initiatives undertaken through the CARES Act and private sector relief efforts have contributed to this reversal. Loan restructurings and forbearances on loan payments have brought relief to households experiencing financial hardship. For example, payments on federally and GSE-backed mortgages can be delayed up to 360 days without incurring a penalty or being classified as delinquent. Payment deferrals have been granted automatically on federally held student loans through the end of 2020. Private credit institutions

have provided payment deferrals on their own as well, typically for three to six months for loans without government backing.⁴⁹ These deferrals either extend the maturity date of the loan or require a balloon payment of the deferred payments at the original maturity. Take-up of these programs by borrowers rose sharply beginning in April. For other types of household loans, auto loans (10.3 percent) and mortgages (8.3 percent) have the highest forbearance rates as of July 2020.

While these programs are meant to provide immediate relief to households experiencing hardship due to the pandemic, there are potentially important long-term implications for financial stability and the economic recovery. Negative amortization on loans in forbearance increases household leverage and may create debt overhang issues in some households. This is particularly true for households with weaker credit profiles, where interest accruals are likely to be larger relative to original balances. As of July, mortgage forbearance rates

Figure 38. Household Delinquency Rates by Credit Score Category (percent)

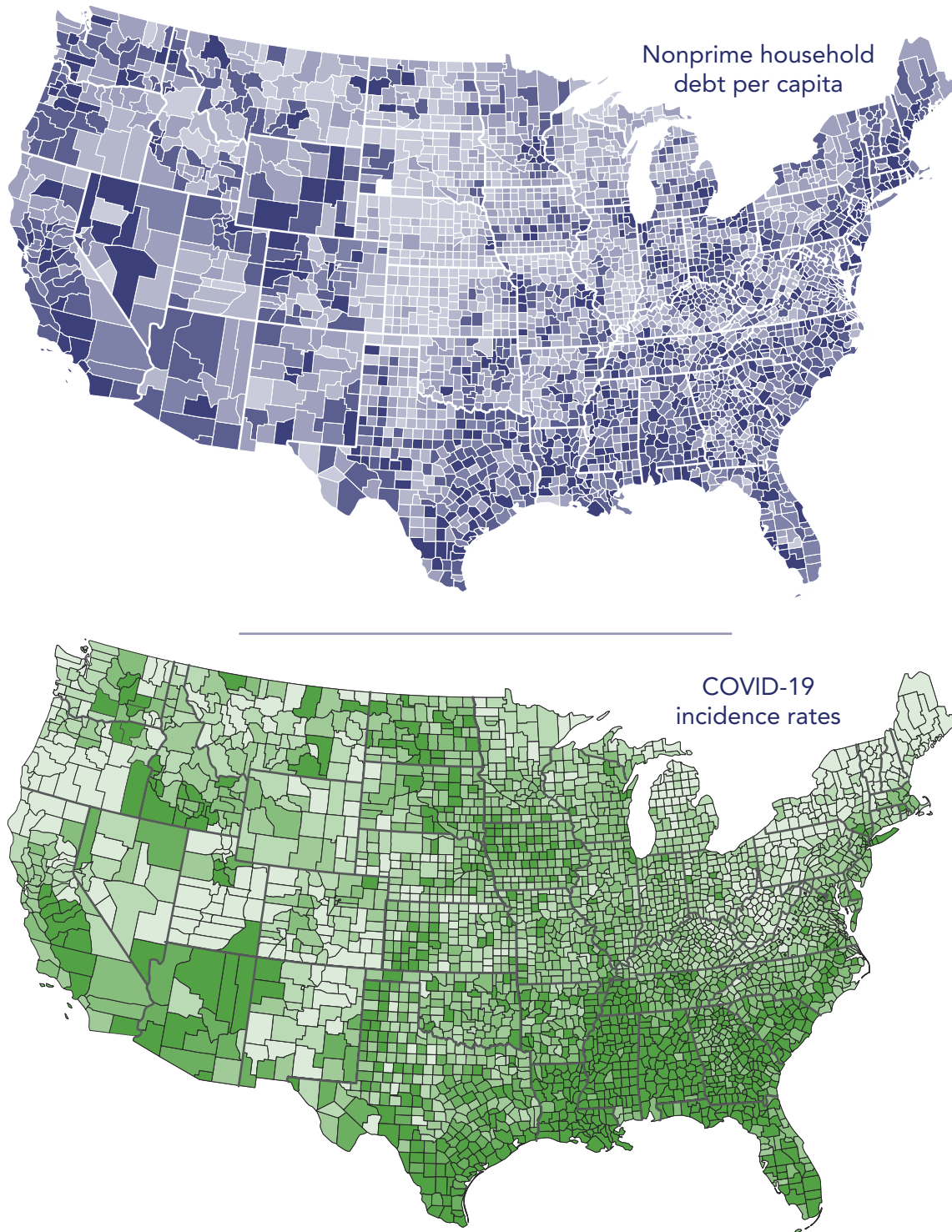


Note: Delinquency rate is calculated as the fraction of balances 30-plus days past due, by credit score category.

Sources: Equifax, Office of Financial Research

are higher for households with credit scores below 620 (30.1 percent) compared with households with credit scores above 800 (6.7 percent). Other types of loans show similar patterns. While relief programs have lowered delinquencies so far, greater debt burdens for households that sought relief may mean prolonged, elevated delinquencies over the long term. These risks may be realized sooner

Figure 39. Geography of Nonprime Household Debt (top) and COVID-19 Incidence Rates (bottom)



Note: Data for the top figure are based on the county-level per capita nonprime household debt as of February 2020. Counties with higher per capita nonprime household debt are shaded darker. Data for the bottom figure are based on county-level COVID-19 incidence rates as of Sept. 30, 2020. Counties with higher COVID-19 incidence rates are shaded darker.

Sources: Equifax, U.S. Census Bureau, Johns Hopkins University, Office of Financial Research

rather than later for many households if payment grace periods or additional government stimulus are not extended.

Household finance vulnerabilities have been uneven during the pandemic, with illnesses and related shutdowns hitting households in some parts of the country harder than those in others. Densely populated areas with greater infection transmission correspond to regions that had higher geographical concentrations of nonprime household debt before the pandemic, or as of February 2020 (see **Figure 39**). The counties in the top quarter of total COVID-19 incidence rates as of September 2020 accounted for 44.8 percent of pre-pandemic total debt balances for nonprime households, and 46.7 percent for prime households. Unemployment claims also surged in these areas, raising concerns about the household incomes relative to expenses. However, various policy actions through the CARES Act appear to have helped subdue these risks. These policy actions included one-time recovery payments and expanded

unemployment benefits. Research by the Federal Reserve suggests that with those measures, 94 percent of households can cover at least six months of expenses, compared with about half with existing savings accounts and standard unemployment benefits alone.⁵⁰

During past recessions, household leverage was a strong indicator of future delinquencies. Coming into this recession, however, households had stronger balance sheets than before the 2007-09 crisis. Before this year, aggregate household leverage has been steadily declining every year since 2010.

Household deleveraging following the 2007-09 crisis was more pronounced for households with credit scores below 660. For these households, leverage remains below pre-2007-09 crisis levels. There is considerable diversity in household leverage across income and credit score groups. Debt payment-to-income ratios (see **Figure 40**) are significantly lower for households with low credit scores than they were in 2007. These ratios have been similar, or have increased slightly, for

households with higher credit scores. The decline for households with low credit scores was primarily driven by the overall reduction in mortgage credit supply for these households, due in large part to tighter mortgage underwriting standards mandated by post-crisis financial reforms.

Leverage has not been as important a factor so far during this recession, as delinquencies have remained low due to the borrower relief measures described above. However, when these measures are eventually phased out, households with the highest leverage are likely to be the most vulnerable.

RESIDENTIAL REAL ESTATE

Residential mortgages were a catalyst for the 2007-09 financial crisis, including some loans packaged into nonagency residential mortgage-backed securities (RMBS). Many nonagency RMBS were packaged into collateralized debt obligations (CDOs) that were, in turn, re-securitized as CDOs-squared. CDOs and CDOs-squared were sold to a broad group of

Figure 40. Changes in Household Leverage by Risk and Income Groups

		Income Groups								Change in DTI ('07-'20)
		2020				2007				
		Low	Middle	High	All	Low	Middle	High	All	
Risk Groups	300-619	18.3%	31.1%	55.1%	30.1%	19.2%	36.1%	84.8%	38.5%	-8.4%
	620-659	19.4%	34.5%	61.9%	35.7%	12.1%	31.2%	75.4%	38.4%	-2.7%
	660-739	14.6%	29.5%	52.9%	32.7%	15.8%	25.0%	57.8%	33.8%	-1.1%
	740-799	9.9%	20.0%	38.9%	25.9%	13.7%	15.0%	39.7%	24.0%	1.9%
	800+	7.2%	9.9%	24.1%	15.5%	43.4%	8.0%	22.8%	22.8%	2.5%
	All Risk	15.8%	22.1%	35.1%		17.0%	21.6%	42.6%		

Note: Table entries display household leverage for each group as of January 2007 and March 2020. Leverage is measured by the debt-to-income (DTI) ratio, which is defined as total monthly payments divided by estimated monthly income. Darker colors are associated with higher DTI values. Income groups are defined as below 67 percent (low), between 67 percent and 200 percent (middle), and above 200 percent (high) of Bureau of Labor Statistics median individual income in 2007 and 2018, respectively. Risk groups are segmented using credit scores from VantageScore 3.0 scores developed by VantageScore Solutions LLC, which range from 300 (worst) to 850 (best).

Sources: Federal Deposit Insurance Corporation, S&P Global Market Intelligence, Office of Financial Research

investors, thereby spreading risk beyond traditional buyers of RMBS. These securities were complex and little understood by investors, a situation that produced market and contagion risks that extended well beyond the underlying default risk of the mortgage collateral.

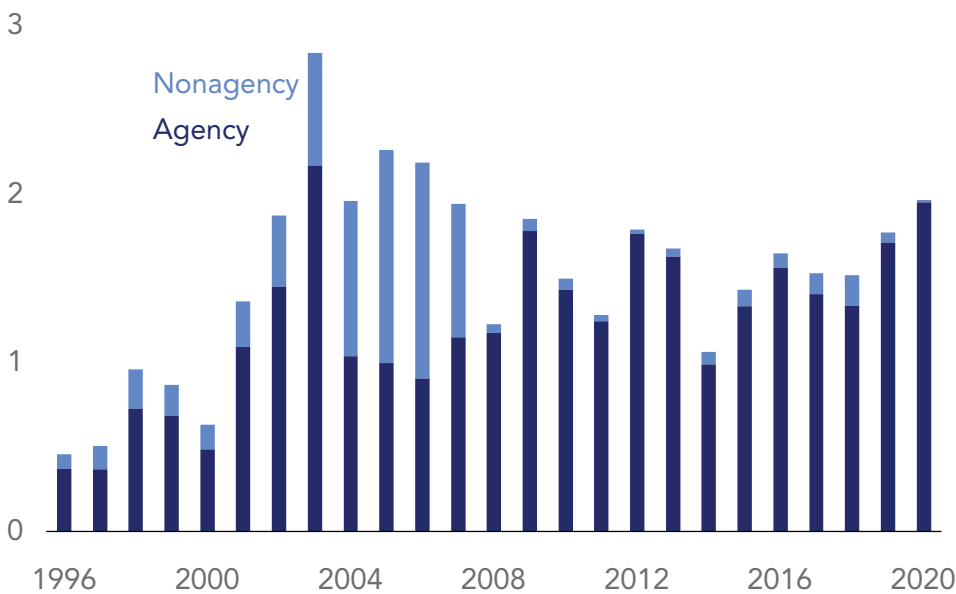
Agency RMBS are now the predominant channel for nonbank mortgage lenders to sell their loans to investors (see **Figure 41**). Agency RMBS are

securities made up of loans bought and packaged by Fannie Mae and Freddie Mac; or loans backed by government, particularly the Federal Housing Administration (FHA) and Department of Veterans Affairs (VA), and securitized via private financial institutions with a guarantee by the Government National Mortgage Association (Ginnie Mae).

Nonbank Mortgage Lenders. For several years, nonbank mortgage lenders

have been increasing their share of mortgage originations (see **Figure 42**), accounting for more than 64 percent of originations as of as of June 30, 2020. While lenders do not have much credit risk once loans are sold to the Fannie Mae or Freddie Mac or guaranteed by Ginnie Mae, they may still have some put-back risk for loans that become delinquent shortly after being originated or are discovered to have other misrepresentations or defects.

Figure 41. Agency and Nonagency RMBS Issuance (\$ trillions)



Note: Data for 2020 are for January through August. RMBS stands for residential mortgage-backed securities.

Sources: Securities Industry and Financial Markets Association, Office of Financial Research

Credit Risk Transfer (CRT)

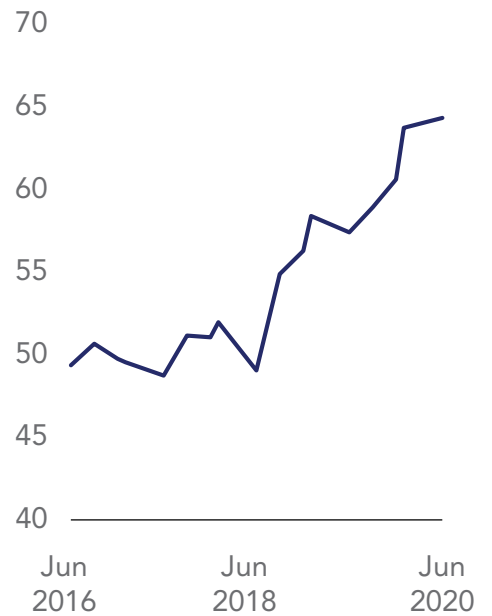
bonds. Fannie Mae and Freddie Mac issue CRT bonds, which are securities with principal repayment tied to the performance of a reference pool of mortgages.⁵¹ The first CRT bonds were issued in 2013. Since then, the structure of these bonds has evolved to include separate reference pools that meet targeted loan-to-value criteria. Higher LTV mortgage loans are riskier, all else equal, allowing investors choices of risk-return profiles.

CRT bonds became a predominant way Fannie Mae and Freddie Mac

transfer mortgage credit risk to private investors.⁵² These bonds reduce the taxpayer exposure to risk assumed in 2008 when the enterprises were put under government conservatorship, overseen by the Federal Housing Finance Agency (FHFA), and invested in by Treasury. CRT bonds support the goal of the FHFA to reduce the enterprises' exposure to mortgage credit risk and increase the role of private capital in the mortgage market.

Investors have been receptive to CRT bonds, one of few ways to directly invest in residential

Figure 42. Nonbank Share of Mortgage Originations (percent)

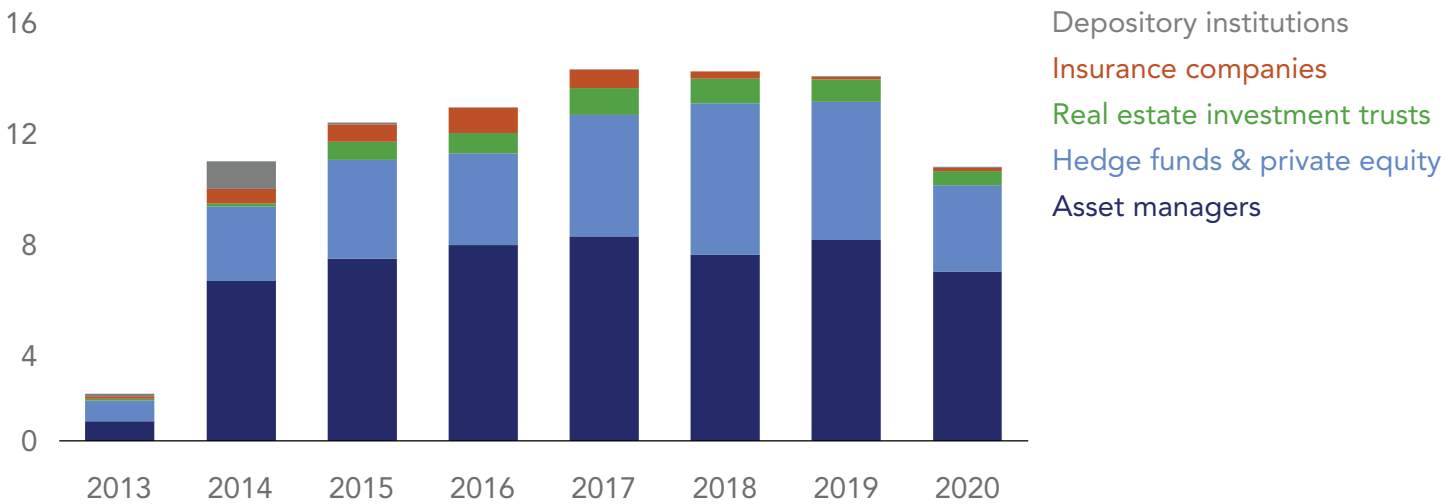


Note: Data as of June 30, 2020. Data represent activities of the top 100 lenders.

Sources: Inside Mortgage Finance, Office of Financial Research

mortgage credit. These bonds are typically issued as mezzanine and subordinated tranches, which are subject to loss before senior tranches of the mortgage pool. The enterprises retain the senior tranche and a share of each of the mezzanine and subordinated tranches. The tranches have varying levels of risk and investor types depending on risk tolerance. Asset managers and hedge funds are significant investors in CRT bonds (see **Figure 43**). Hedge funds are the largest

Figure 43. Investors in Credit Risk Transfer Bonds at Issuance (\$ billions)



Note: Issuance for 2020 is through September 30. Asset managers include sovereign funds and money managers.

Sources: Fannie Mae, Freddie Mac, Office of Financial Research

holders of the riskiest bonds.

CRT bonds have been sold for less than a decade. The pandemic is the first time that these bonds have faced substantial stress. Prior to the pandemic, CRT bonds traded at all-time tight levels, meaning that bid-ask spreads were small and large blocks of bonds could trade without significantly affecting price. CRT bonds traded at distressed prices in March because of uncertainty over the level and duration of credit risk. The Federal Reserve's asset purchase programs to stabilize the mortgage markets provided no relief because these programs excluded CRT bonds. Issuance of new CRT

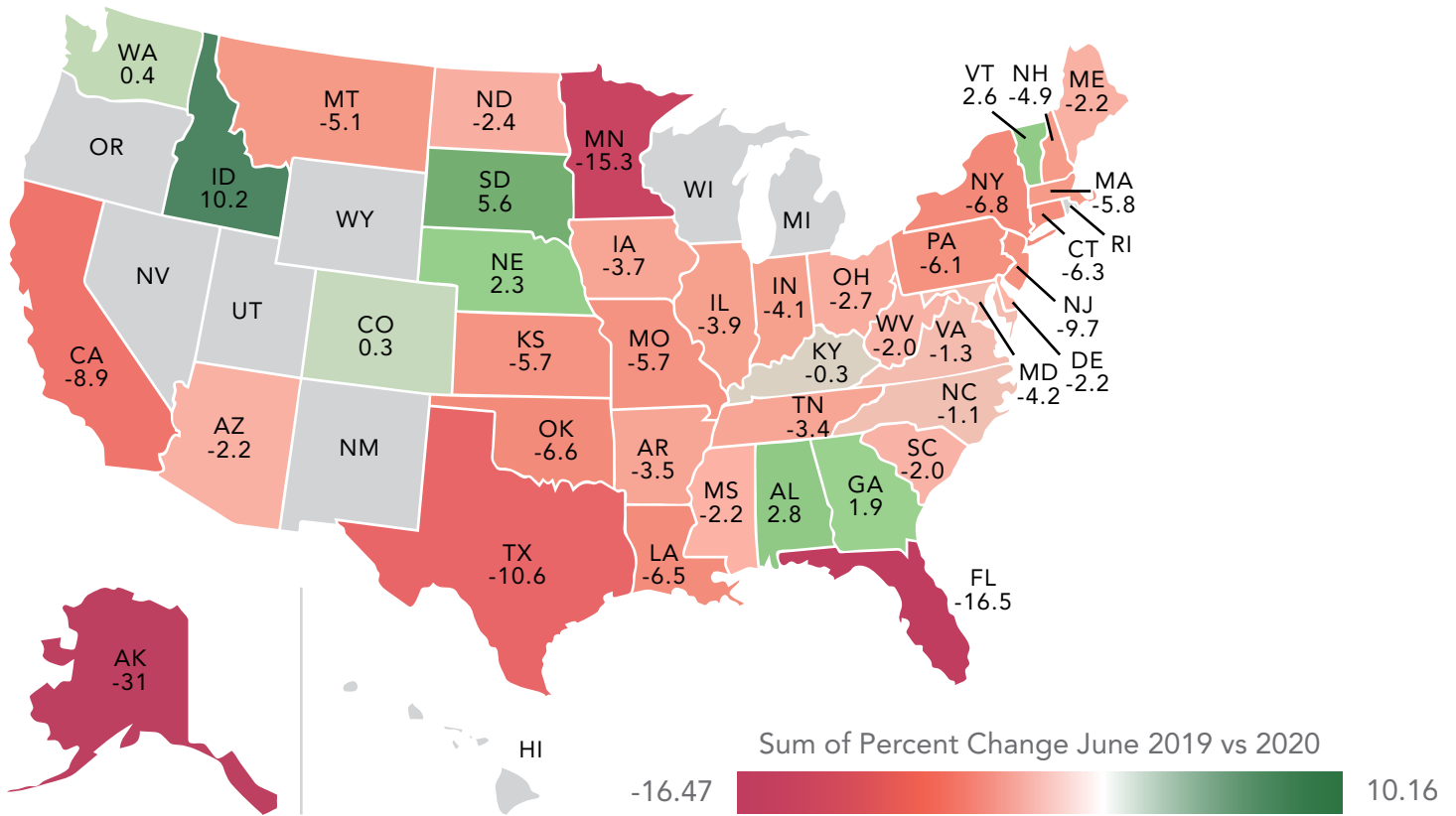
bonds by the enterprises largely shut down during the second quarter. Fannie Mae and Freddie Mac issued no new CRT bonds in the quarter, although Freddie Mac executed two new offerings in July.⁵³ As in other markets, prices have rebounded since March.

Uncertainty about CRT bond credit risk was high in the spring. Specifically, it was difficult to assess the degree to which payment forbearance or rising delinquencies in the mortgage reference pools were increasing the credit risk of CRT bonds. The performance of CRT bonds bears continual monitoring.

CRT bonds allow Fannie Mae and Freddie Mac to

reduce their risk-based capital requirements because the bonds transfer some of the credit risk to investors. Regulatory capital requirements are suspended while the enterprises are in conservatorship. In May, the FHFA released a revised capital proposal detailing the capital that Fannie Mae and Freddie Mac would be required to hold after they are moved out of conservatorship (see **Financial Firm Insolvency Risk and Potential Contagion**).⁵⁴ Under this proposal, the risk-based capital benefit from the use of CRT bonds is reduced to \$22.1 billion, about half of the \$41.3 billion under a 2018 FHFA proposal.

**Figure 44. Percent Change in State Tax Revenue
(March-August 2019 vs. March-August 2020)**



Note: There was a 6 percent total decline for all states. States that did not have all data as of Sept. 30, 2020, include Hawaii, Michigan, New Mexico, Nevada, Oregon, Rhode Island, Utah, Wisconsin, and Wyoming.

Sources: Urban Institute, Office of Financial Research

STATE AND LOCAL DEBT

The financial effects of the COVID-19 pandemic have been pronounced for state and local governments. Revenue from income taxes, sales taxes, and business taxes has fallen (see **Figure 44**). Revenue has also declined from stadiums, toll roads, airports, and other projects built with municipal bond debt (see **Figure 45**). At the same time, expenses for health care, education, and other

services provided by state and local governments have risen and are predicted to rise even more. For instance, requirements for more frequent cleaning and for social distancing among students have increased the cost of running schools.

The additional expenses have come at a time when state and local budgets are already under pressure. Pension plans for state and local governments are substantially underfunded

in aggregate, which means that many governments need to make large contributions to adequately fund their plans (see **Pension Funds**). To preserve liquidity, some sponsors have deferred contributions. For example, the state of New Jersey announced that it would delay a quarterly contribution of \$950 million to its pension fund by one month. New Jersey's pension fund is only 38 percent funded.⁵⁵

State and local governments have already tried to cut budgets through various means, including by laying off workers. Finding new sources of revenue to replace those that were lost has been challenging since raising taxes can be politically difficult or, in some jurisdictions, legally impossible. The Federal Reserve’s Municipal Liquidity Facility is available to buy short-term debt from states and certain counties, cities, or other entities to help them bridge cash flow problems. Illinois and

New York’s Metropolitan Transportation Authority are the only current borrowers from that facility.

States and localities rely heavily on debt to build infrastructure and run essential services (see **Figure 46**). The two main types of municipal debt are general obligation bonds — backed by a government’s overall tax revenue — and revenue bonds — backed by specific revenue streams. Of the

\$3.9 billion in municipal bonds outstanding in May 2020, 26 percent were general obligation bonds, 64 percent were revenue bonds, and 10 percent were classified as other.⁵⁶

Defaults at the state level are unlikely, according to credit rating agencies.⁵⁷ General obligation bond defaults have been low for the last decade, and are expected to stay that way. There has been one municipal default since the

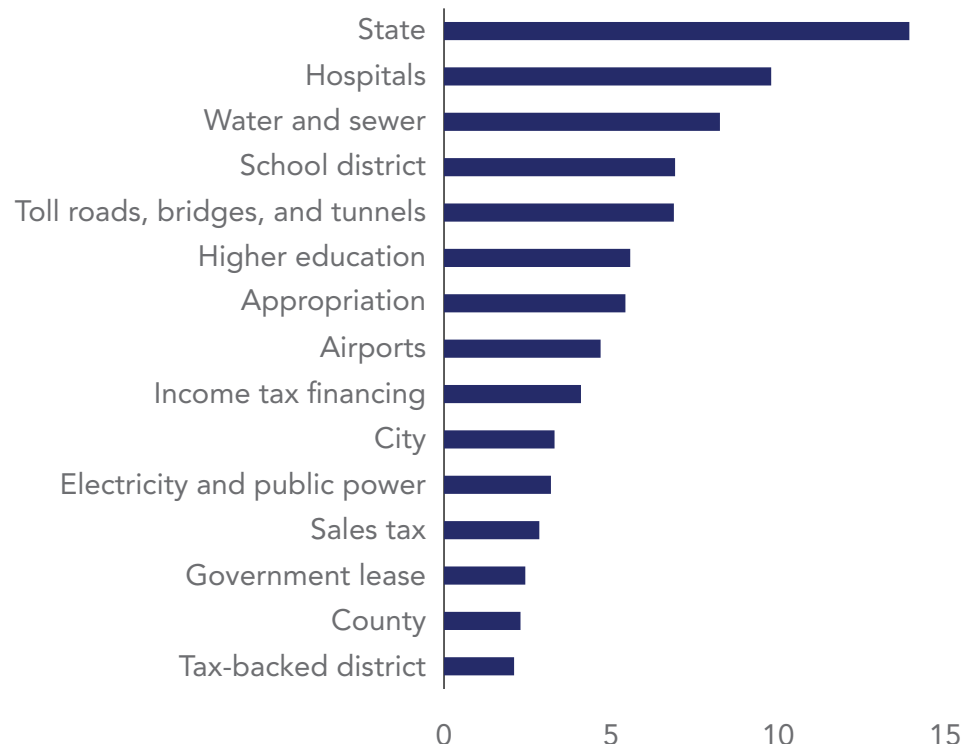
Figure 45. Estimated Revenue Losses (\$ billions)

Issuer	Estimated Loss for FY 2021
States	290
Cities	117
Counties	114
Transit systems	24
Water systems	14
Sewer systems	12
Toll Roads	9
Total	580

Note: Fiscal year (FY) 2021 began July 1, 2020. \$580 billion in total losses equals 38 percent of FY 2019 tax revenues.

Sources: Census Bureau, Center on Budget and Policy Priorities, EBP US, Inc., International Bridge, Tunnel, and Turnpike Association, National Association of Counties, National League of Cities, Raftelis, Office of Financial Research

Figure 46. Proceeds of Municipal Bond Issuance (percent of par value)



Note: Breakdown uses Bloomberg/Barclays’ bond classification. Those categories below 2 percent of relative par value are not shown; they total 18 percent in 27 categories.

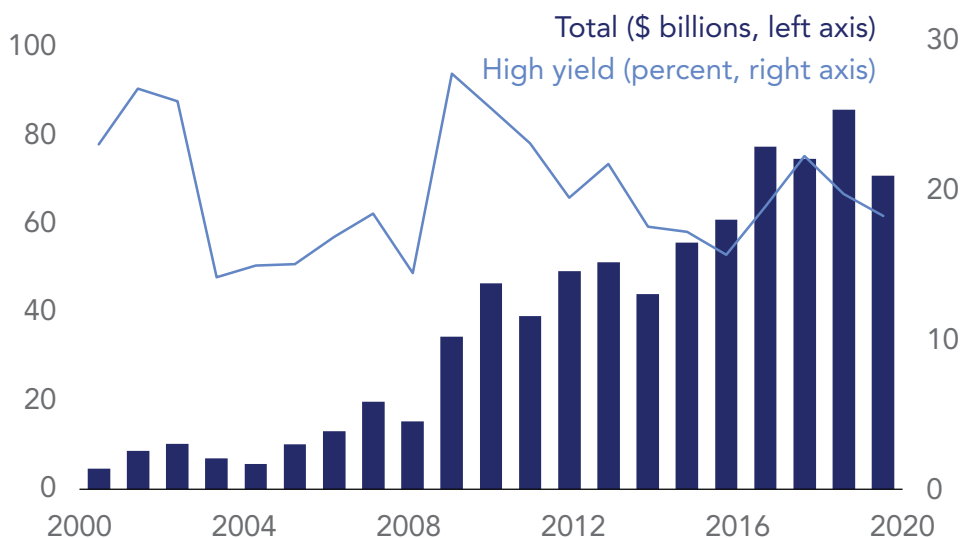
Sources: Barclay’s Municipal Bond Total Return Index, Bloomberg Finance L.P., Office of Financial Research

pandemic started, Fairfield, Alabama in May, but that city's financial problems predate the pandemic.⁵⁸ A few other especially stressed localities might default. Credit rating agencies expect most municipal bond defaults to come from bonds backed by dedicated revenue streams.

High-yield municipal market issuance has grown in market size to \$85 billion in 2019 from \$5 billion in 2000. However, the percentage of municipal bond issuance that can be classified as high yield has varied from year to year between the mid-teens and high twenties for the past 20 years (see **Figure 47**). In total, high-yield bonds account for 20 percent of all municipal bond issued between 2000 and 2020.

The high-yield municipal market is not characterized as such by the bonds' credit ratings, but by the relatively higher risk of the type of issuers. Sectors perceived as high risk include, for example, schools, hospitals, and toll roads, and are not necessarily traditional municipal issuers. The revenue streams backing these bonds vary, along with

Figure 47. Municipal Bond Issuance (\$ billions, percent)



Note: 2020 issuance includes debt issued through Sept. 30, 2020. High-yield sectors are not based on ratings but defined as nursing homes, hospitals, casinos, prisons, industrial improvements, charter schools, student housing, retirement homes, parking, parks, recreational facilities, stadiums, and university improvements.

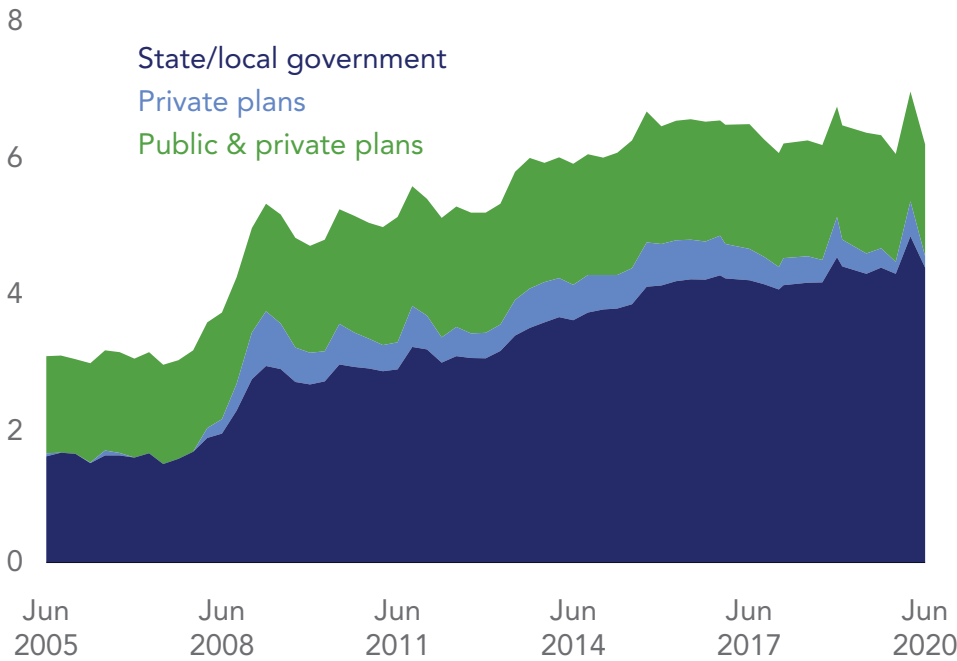
Sources: Bloomberg Finance L.P., Office of Financial Research

their risk profiles. Bonds supported by communal living facilities, such as senior and student housing, could be at substantial risk as a result of the social distancing required by the pandemic. Other sectors such as charter schools and private colleges could be at risk due to changes in educational delivery methods, the requirements of social distancing, and increased cleaning costs. Convention centers, stadiums, and other large indoor meeting areas could be affected if large gatherings take place less frequently.

PENSION FUNDS

Many pension funds across the United States are significantly underfunded as the present value of benefit liabilities exceeds their assets. The size of the funding gap reflects, among other factors, the discount rate used to calculate future liabilities and on the assumed investment returns used to project asset growth. Pension plans are designed with the expectation of earning adequate returns over a long-term horizon. If these returns are not realized, plan sponsors have to increase plan contributions,

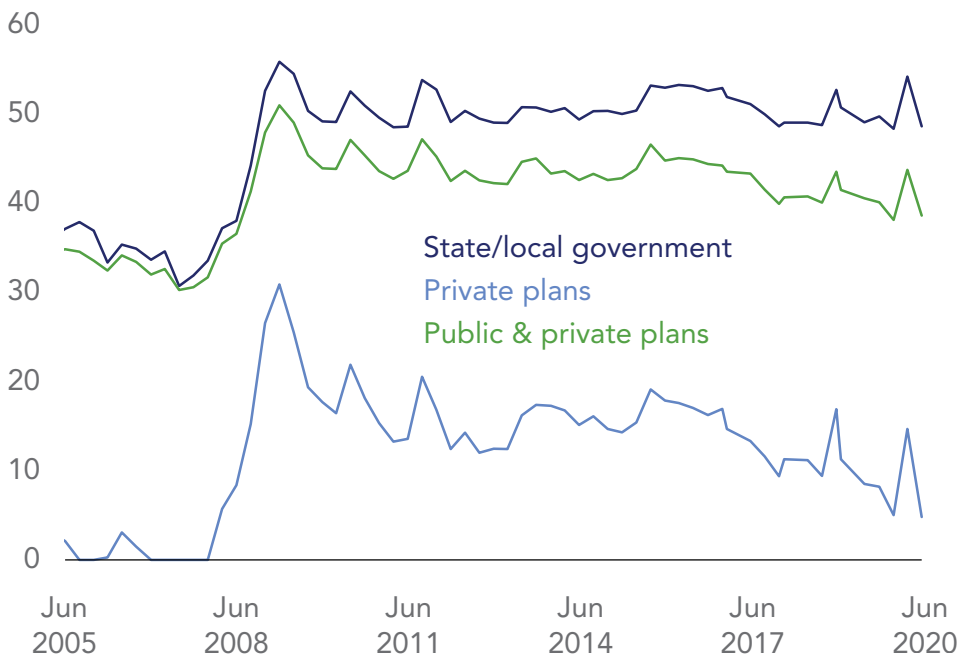
Figure 48. Pension Underfunding (\$ trillions)



Note: Data as of June 30, 2020. Public and private category includes federal pension plans.

Sources: Board of Governors of the Federal Reserve System, Office of Financial Research

Figure 49. Pension Underfunding (percent)



Note: Data as of June 30, 2020. Public and private category includes federal pension plans.

Sources: Board of Governors of the Federal Reserve System, Office of Financial Research

pressuring the overall finances of the sponsor. Data from the Federal Reserve allow comparison of funding levels for private and public pension funds.⁵⁹ Private pension funds were underfunded at 4.8 percent, while state and local government plans in aggregate are deeply underfunded at 48.3 percent as of June 30, 2020 (see **Figures 48** and **49**).

In the United States, there are about 6,000 public pension plans with a combined \$4.4 trillion in assets and more than 25 million retired and active workers as plan participants.⁶⁰ The COVID-19 pandemic worsened an already difficult situation for many U.S. public pension funds. Increased expenditures by state and local governments, along with falling tax revenue due to the pandemic, have increased the pressures faced by state and local governments. This incentivizes them to skip their regular pension plan contribution (to the extent they can) and also makes it unlikely that they will have the ability to top up the underfunded pension amounts anytime soon.

If sponsors are unable to increase their contributions, then pension funds may instead try to close the gap by relying on increasingly aggressive investment strategies.

Pension plan liabilities are sensitive to interest rate changes, with declining interest rates raising the cost of future benefits. As most pension funds have sizable fixed-income allocations, achieving targeted investment returns becomes more difficult as interest rates decline. With interest rates remaining low, plan sponsors may have to substantially increase their future plan contributions to make up for lower

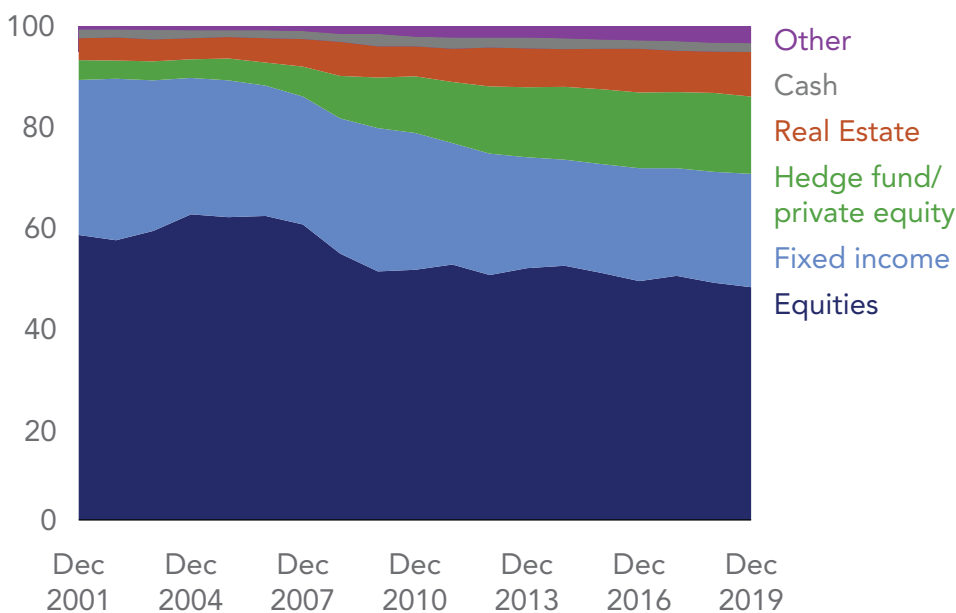
investment income. Alternatively, they can shift their asset allocation to higher-risk and higher-return or alternative investments. Pension plans for state and local governments have increased their allocations in hedge fund and private equity investments as well as real estate (see **Figure 50**).

California Public Employees' Retirement System, the largest public pension plan in the United States, recently announced that it would increase its investments in private equity and use leverage to boost its expected investment returns.⁶¹ Some public pension fund

sponsors increase their leverage through Pension Obligation Bonds (POBs). POBs are taxable municipal securities issued by state or local governments to meet pension obligations. Investors in POBs look to the state or municipality for interest and principal payments. The pension fund would have more assets to invest as well as lower its unfunded liabilities. It can leverage the low borrowing costs and invest in higher-yielding assets to increase its investment income.

Many pension benefits are enshrined in state law and practices, making it difficult for plan sponsors to reduce future benefits and thereby reduce liabilities. Chapter 9 of the U.S. Bankruptcy Code allows municipalities to reorganize and renegotiate terms with creditors.⁶² Bondholders and pension plans would have conflicting interests in renegotiating terms with the municipality. States (and by default state-sponsored pension plans) are not able to file for bankruptcy. They usually are required by state law to balance their budget annually. If a state is unable to meet its obligations, it would likely default.

Figure 50. Public Pension Fund Investments (percent)



Note: Annual data as of Dec. 31, 2019.

Sources: Public Plans Database, Office of Financial Research

The federal Pension Benefit Guaranty Corporation operates two separate programs, the Single-Employer for standard plans and the Multiemployer Insurance Programs for joint plans sponsored by multiple employers and an affiliated union. Each of those programs allows for payment of benefits, up to a legal maximum limit, to retirees in private defined benefit pension plans where sponsors cannot pay promised benefits. The Multiemployer Insurance Program is financially challenged and is expected to run out of money to pay benefits by the end of FY 2026 or 2027.⁶³

FOREIGN GOVERNMENT DEBT

The COVID-19 pandemic is not expected to constrain foreign government debt issuance over the near term. Credit market conditions remain favorable for rolling over this type of debt, and there has been support to the most vulnerable countries through mechanisms such as World Bank Group debt service suspension. However, in the first half of 2020, credit rating agencies downgraded the

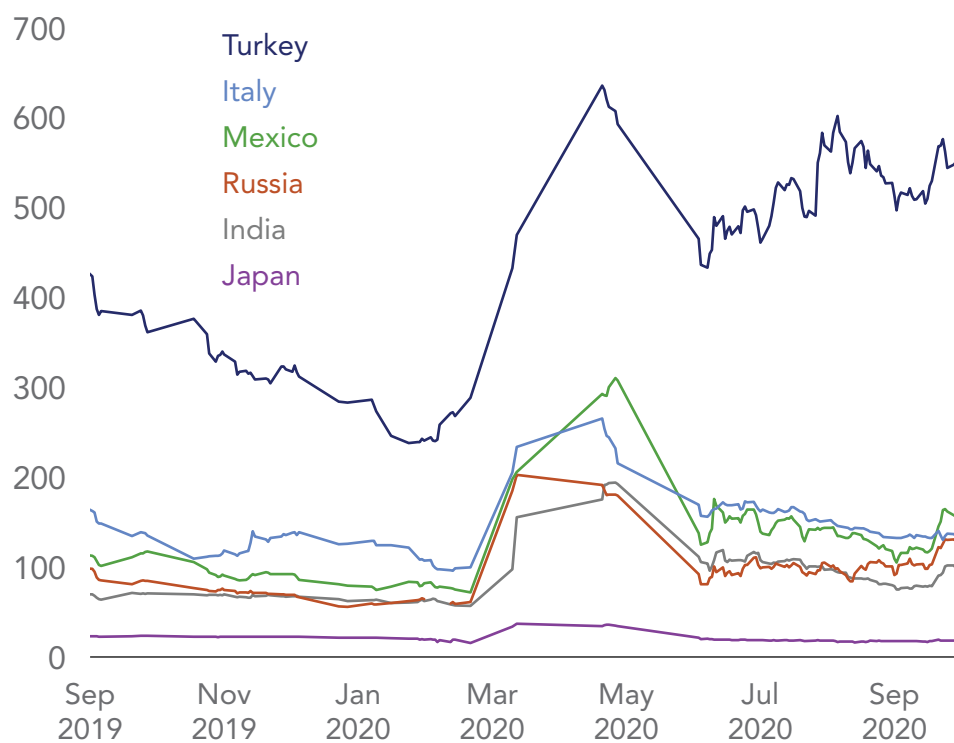
debt of 28 countries, and put 54 others on negative watch for possible future downgrades.⁶⁴ These ratings actions suggest that several countries, including some large ones, have rising default risk. So does the persistent increase in credit default swap spreads (see **Figure 51**). Without support through organizations such as the European Central Bank (ECB) and the International Monetary Fund, some sovereign debt will remain tenuous at best. While U.S. banks

are not heavily exposed to emerging market sovereign debt, many Asian and European banks are. Connections between U.S. and foreign banks exposed to risky sovereign debt could transmit losses to U.S. banks.

Sovereign debt risk can be characterized in four categories:

- Large economies, such as India, Italy, the United Kingdom, and Japan, had fiscal constraints

Figure 51. Selected Five-year Credit Default Swap Spreads for Six Countries (basis points)



Note: Shows five-year contracts of the same maturity. The spread is the price of the credit default swap. A spread of 100 basis points means that it costs \$1 to insure \$100 of debt.

Sources: Bloomberg Finance L.P., Office of Financial Research

going into this crisis. For example, Japan and Italy have high debt-to-GDP ratios. Italy is at increasing risk of default, as discussed in more detail in this section. Japan suffers from persistently low economic growth. The United Kingdom faces economic headwinds and costs associated with its separation from the EU. Financing costs for these countries will increase over time, possibly making fiscal austerity measures necessary over the long run.

- Nations dependent on oil and other commodity revenues may not be able to provide fiscal stimulus to counteract the effects of the COVID-19 pandemic on their economies. Mexico, Oman, and Iraq, for example, were already facing fiscal pressures coupled with weak economic growth. These nations face a difficult choice between fiscal austerity and increasing their debt and risk of default. Ecuador has already restructured its debt.
- Nations largely dependent on tourism or

other single sources of income, such as Egypt, Turkey, and Costa Rica, experienced sharp income declines with the reduction in travel. As long as the COVID-19 pandemic continues, these countries face a dire financial outlook. Without international support, their finances could become unsustainable.

- Stronger economies with diversified income sources, such as the United States, China, and Germany, are taking on debt equal to more than 10 percent of gross domestic product. That much debt can threaten long-term growth and risks inflation.

Italy's debt could become problematic down the road. Coming into the COVID-19 crisis, Italy already displayed characteristics associated with a sovereign debt crisis. The Italian economy was experiencing high unemployment and sluggish growth. More important, the country had a debt-to-GDP ratio close to 135 percent. That amount of debt is common for countries on the verge of default. In fact, the last time Italy had amassed that much debt

was in 1940, when the country defaulted on its obligations in the same year it entered World War II.

As the pandemic unfolded, Italy was particularly hard hit, with more than 35,000 deaths. The country's economic hub, the Lombardy region, was locked down for months. The Italian government rolled out a series of economic packages to stem the economic decline, at a cost of €70 billion-€100 billion.⁶⁵ Coupled with a drop in GDP, Italy's debt-to-GDP ratio rose to 155 percent by May.⁶⁶ Italy is forecast to reach a debt-to-GDP ratio of 180 percent by year-end if fiscal conditions remain in the present state, bringing it closer to that of Greece.⁶⁷

What is keeping the Italian sovereign bond market afloat and at depressed yields is the ECB's Public Sector Purchase Program (PSPP). Italian bonds make up more than 22 percent of the PSPP's purchases. The ECB could end up owning more than 40 percent of Italian government bonds by the end of 2020.

For now, Italy's interest payments total a manageable 5 percent of

GDP, with yields averaging 1.2 percent. Moreover, a recently negotiated European Union €750 billion economic stimulus package will boost Italy's GDP.⁶⁸ However, there is a risk that at some point, without concerted intervention from the ECB and fiscal support from the EU, investors may become more reluctant to buy Italian bonds as the debt service coverage ratio becomes increasingly unsustainable.

Problems are already apparent in Argentina. On May 24, Argentina defaulted on its debt for the ninth time in its history (see *Argentina's History of Defaults*). Argentina's financial and economic position is not unusual in emerging markets. Like other emerging market countries encountering a deteriorating fiscal situation, Argentina does not have well-diversified sources of revenue. Argentina's debt-to-GDP ratio is 89 percent, based on year-end 2019 debt of \$325 billion, and its inflation rate is 45 percent. Several smaller and even medium-size economies are experiencing similar tumult, adding pressure to multilateral institutions and wealthier countries to

ARGENTINA'S HISTORY OF DEFAULTS

On May 24, Argentina failed to make good on a coupon payment of \$500 million due to its creditors, marking the ninth default in its history. The first was in 1827, 11 years after independence. In 1913, Argentina's GDP was larger than that of the United States. Since then, however, the country has experienced a vicious cycle of recessions, hyperinflation, and serial defaults. This year, the country's GDP is expected to contract as much as 12 percent.

Argentina knows from experience how to deal with the demands of creditors and the International Monetary Fund while retaining its domestic priorities. The IMF supports a debt restructuring offer made by Argentina's government on May 26, citing the need for a sustainable debt-to-GDP ratio through 2030. The proposal suggests a two-year moratorium on payments instead of the initial three years, along with principal reductions of 7 percent for debt due in 2030 and 5 percent for debt due in 2035 and 2046. Striking a deal could avoid years of legal battles and prevent the country being locked out of global capital markets, which happened in the 2001 default. The offer was agreed to by the largest creditor group on August 4.⁶⁹ Argentina conceded on the payment dates on the new bonds, keeping the value of the bonds the same despite the reduction in principal. Following the agreement, Argentina's bonds maturing in 2028 were trading at 46 cents on the dollar. The IMF is also taking a softer stance with respect to Argentina's plan to repay a \$56 billion standby agreement received in 2018. Argentina can potentially delay four payments due during 2021 to 2023, as well as austerity measures set to take effect around the same time.

continue their support. Of note is the instability of the Turkish lira, which lost 40 percent of its value over six months. Turkish consumer prices rose 11.8 percent year-over-year in August, the 10th straight month of double-digit price increases.

MARKET RISK

Market volatility can pose a risk to financial stability through widespread simultaneous investment losses, margin calls, and the disorderly unwinding of trading positions. Liquidity effects can be transmitted to other markets and market participants. For years prior to the pandemic, market risk was elevated by high equity valuations and considerable duration risk in fixed-income markets. With the COVID-19 pandemic and resulting lockdowns, investors fled risky assets for the security of cash. The severity of market reactions may have reflected both the economic effects of the pandemic and government efforts to contain the health threat.⁷⁰ Containment efforts have harmed service-oriented and global businesses the most. These types of businesses have grown as a share of the U.S. economy over time.

The quick and aggressive policy response to stabilize the economy and markets subsequently drove a recovery in valuations and ensured that markets continued to function amid the sell-offs and volatility spikes. Given the financial market recoveries, vulnerabilities remain from elevated equity valuations and high bond duration.

STOCK MARKETS

Stock markets declined on deteriorating investor sentiment, increasing uncertainty, and falling expectations for earnings with the arrival of the COVID-19 pandemic in the United States. The S&P 500 index fell 34 percent between its February 19 then-record peak and its March 23 bottom. In late March, consensus earnings estimates for 2020 were down 7.2 percent from the start of the year, and continued to fall as the year progressed.

Beginning on March 16, the Federal Reserve announced lending facilities to assist U.S. businesses in weathering an economic downturn expected to be unprecedented in its severity (see *Federal Reserve Actions to Support*

Markets and Credit Availability). The Federal Reserve's actions and the CARES Act coincided with investors resuming purchases of risky assets. News regarding antiviral treatments and vaccine development efforts also contributed to higher investor confidence. The S&P 500 gained 60 percent from the March low through early September, reaching a new record high. The recovery was driven by the technology sector, which was perceived as less vulnerable to the negative effects of the pandemic. Other sectors have not fully recovered, as reflected in the Russell 2000 Index of small-capitalization stocks, which as of the end of September remained down 11.6 percent from its January peak. With the partial rebound in equity prices, there is a risk that unexpected increases in COVID-19 infections and the reinstatement of lockdowns could adversely affect consumer and business confidence and thus once again curtail economic activity and cause investors to reduce their exposure to risky assets.

Implied stock market volatility as measured by

the Chicago Board Option Exchange Volatility Index, often called the VIX, was the highest since the fall of 2008, averaging 58 during March, up from the mid-teens in January and the first half of February. Realized volatility, as measured by absolute monthly return for the S&P 500 index, was the second highest ever in March. Average daily trading volume in March set a record at almost 16 billion shares. Additionally, single-day price declines in March were some of the largest in history. The S&P 500 index fell 12 percent on March 16 and 9.5 percent on March 12. These large one-day declines triggered market-wide circuit breakers four times (see *How Well Did the Circuit Breakers Work?*). Despite high volatility and trading volume, there were no major issues with market infrastructure.

DERIVATIVES MARKETS

Derivatives contracts such as futures, listed options, and swaps have values derived from the underlying instruments, products, or indicators, such as interest rates, currencies, equities, commodities, or precipitation levels. Derivatives positions can

have profits and losses that are greater than the volatility of underlying asset prices. To take on a derivatives position, the parties to the contract(s) must post initial margin in the form of cash or Treasuries. This initial margin protects each party in the event of default by the counterparty. Also, for each day the contract is active, one party must post variation margin to the other in an amount equal to the change in the trade's market value.

Market volatility in March led to unusually large variation margin payments. The parties that had to post variation margin sometimes raised the cash via sales of assets referenced by derivatives contracts, creating a feedback loop. Initial margins also increased as liquidity and counterparty credit declined along with market volatility.

As an example of the volatility experienced by derivatives markets, credit default swap (CDS) spreads and transaction costs spiked during late March to levels rarely seen since 2008. A CDS allows an investor to "swap" or offset its credit risk with that of another investor. For example, a

buyer of credit protection might be a lender that wants to hedge against a borrower default. The seller insures the underlying debt and will pay in case of a default. The CDS spread measures the cost of that credit protection. For example, a spread of 100 basis points means that it costs \$1 to insure \$100 of debt.

The volatility of the CDS market produced a surge of calls to post higher margins. The CDX North America investment-grade and high-yield CDS indexes rose to peaks of 151 and 834 basis points, respectively, compared with 45 and 294 basis points just one month prior (see **Figure 52**). Bid-ask spreads hit peaks of 7.6 and 25.5 basis points, respectively. As in the 2007-09 crisis, a number of institutions with significant derivatives exposures experienced large losses. However, fewer failed this time, due in part to stronger capital positions to weather losses and liquidity positions to meet margin calls.

Margin calls were significant for sellers of credit default protection. A large proportion of calls for existing positions were for variation margin payments, though initial

margin increased globally by 31 percent. Between late February and mid-March, cumulative net variation margin payments totaled around \$32 billion for net sellers protection, based on data from the Depository Trust & Clearing Corporation. Asset managers were collectively the largest net protection sellers, while broker-dealers — trading in their own accounts and for their clients — were the largest net buyers. As CDS spreads rose, margin payments flowed from asset managers to broker-dealers. Payments were concentrated in a few institutions. As conditions improved in subsequent weeks, protection sellers experienced reduced mark-to-market losses and requirements for margin.

The timely flows matter because during market stress periods, dealers act as intermediaries in the CDS market. In this role, dealers may satisfy demand for protection purchases from other institutions. Their capacity to bear related risks owes, in part, to the profit they make on hedges and offsetting positions. Because asset managers were able to make their margin payments to dealers, dealers were able to increase their

protection sales (largely to hedge funds) from February to March by \$55 billion. This amount equaled one-third of their protection purchases earlier in the year. While derivatives markets in general, and CDS markets specifically, remain vulnerable to future stress, during the spring's instability they displayed resilience, albeit with help from the Federal Reserve's facilities.

BOND MARKETS

Bond prices decrease with increases in interest rates, all else equal. Bond duration — a measure of bonds' price sensitivity to interest rate changes —

increased from the prior year-end and remains just below its 2018 peak. The duration of the Bloomberg Barclays U.S. Aggregate Bond Index is 6.1 years as of September 2020, above its long-term average of 4.85 years. Given the current duration, a percentage point increase in interest rates would lead to a decline of 6.1 percent or \$1.5 trillion in the market value of the Barclays Index. More specifically, an increase in rates of only 0.19 percentage points (19 basis points) would cause a market price decline that would entirely offset the income of the Barclays Index.

Figure 52. Credit Default Swap Indexes (basis points)



Note: Series are the Markit North American 5-year index composites.

Sources: Markit, Office of Financial Research

HOW WELL DID THE CIRCUIT BREAKERS WORK?

Today's market-wide circuit breakers were created in response to the October 1987 market crash. They are a failsafe measure that forces a pause in equity trading, and equity-related options and futures trading, in the event of severe declines in the S&P 500 index. Trading pauses allow traders and investors time to reassess asset valuations, and allow central counterparties and brokerages to make margin calls if necessary. There are three levels of market-wide circuit breakers, and they go into effect automatically under the following conditions:

LEVEL 1

7%



A Level 1 circuit breaker is triggered if the S&P 500 index declines 7 percent from its level at the close of the previous trading day. The trading day runs from 9:30 a.m. to 4:00 p.m. Eastern Time. A Level 1 circuit breaker halts trading for 15 minutes if the drop occurs before 3:25 p.m.

LEVEL 2

13%



A Level 2 circuit breaker, which halts trading for another 15 minutes, is triggered if the index declines 13 percent from its previous close before 3:25 p.m.

LEVEL 3

20%



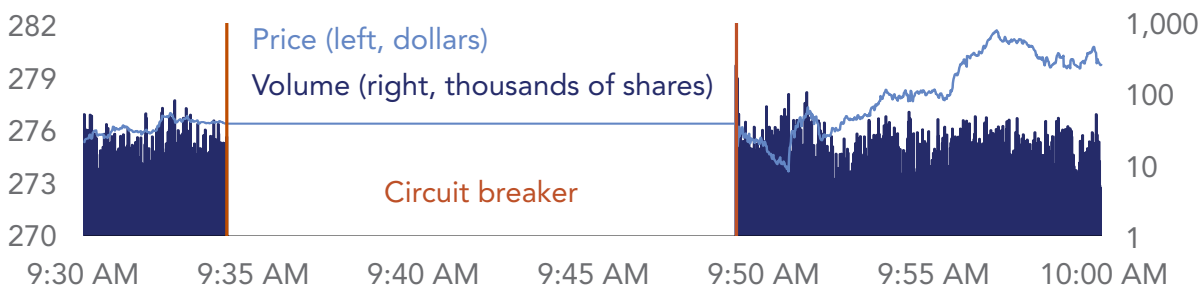
A Level 3 circuit breaker, which halts trading for the rest of the day, is triggered if the index declines 20 percent.

The Level 1 circuit breaker was triggered on March 9, 12, 16, and 18. For the first three days, the breakers were triggered within 15 minutes of the start of the trading day (see **Figure 53**). On March 9 and 12, the triggers did not occur immediately with the price decline. This was because the calculation to trigger the circuit breaker requires that a stock in the S&P 500 index trade at least once before its value within the index is updated. Several stocks included in the index did not trade until several minutes after the market opened. This delay allowed for several S&P 500-linked derivatives products to trade at prices below the trigger threshold.

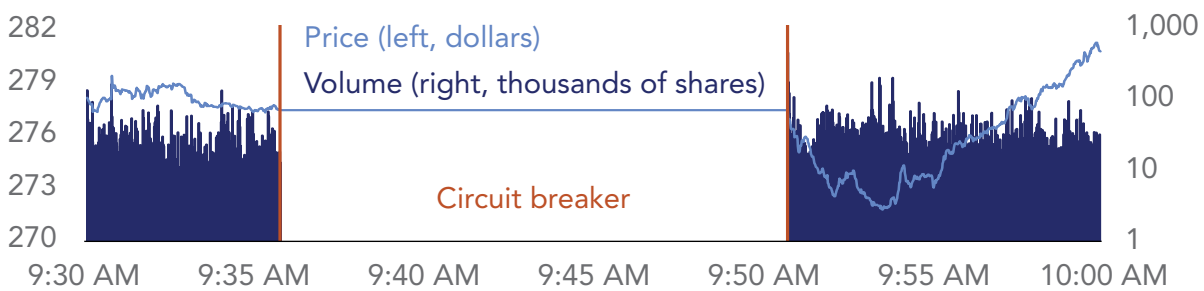
The system for implementing the breakers functioned well, and trading venues and traders were well-prepared for this rare event and the level of coordination

Figure 53. Four Days Market-wide Circuit Breaker Halted Trade

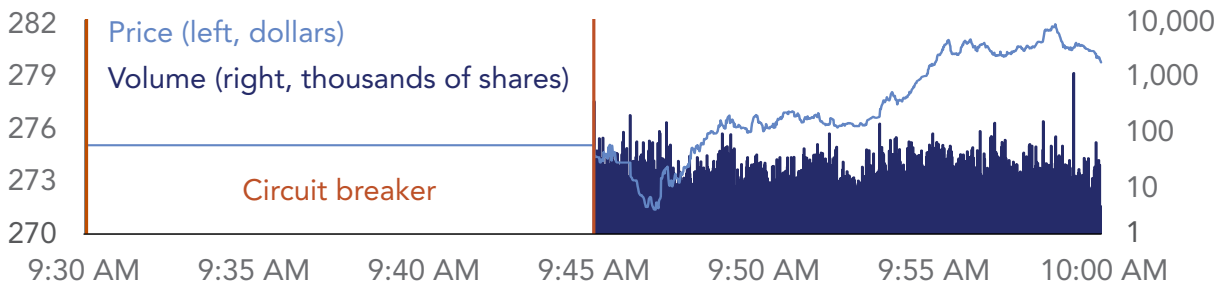
March 9



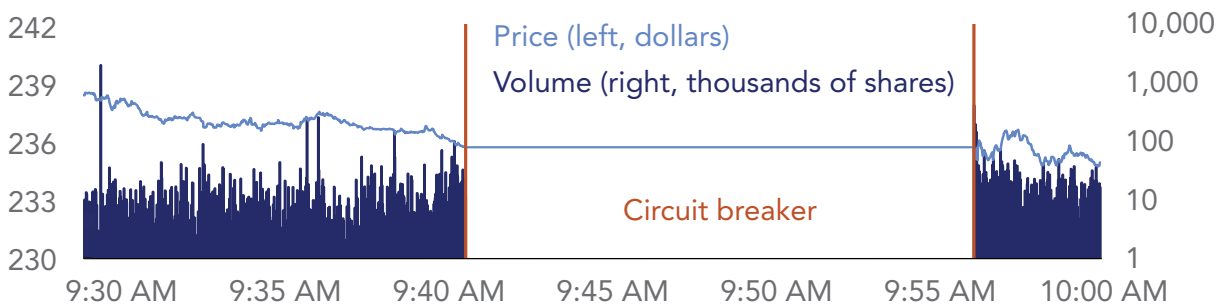
March 12



March 16



March 18



Note: The plot presents the SPDR S&P 500 Trust ETF's price (dark blue) and logarithmic volume (light blue), and highlights the four market-wide circuit breaker periods in March 2020.

Sources: May Street, NYSE, NASDAQ, Office of Financial Research

required. The only other time the Level 1 circuit breaker was triggered was in 1997.⁷¹ For these four events in March, the halting and resuming of trade was orderly. There were only a few minor changes made to implementation by the primary exchanges and Securities Information Processors — which link quoted prices and trades for various markets into consolidated data feeds — over the two-week period.

The circuit breakers appear to have been successful in helping to stem the market decline. Although stock prices continued to trend down at the end of the trigger periods for at least a few minutes, they then returned to more typical patterns for short-term price changes.

Investors accept this duration risk in an effort to seek higher investment yields in what is a very low risk-free interest rate environment. Market participants see the risk of an unexpected sharp rise in interest rates as low.

LIQUIDITY AND FUNDING RISK

When the COVID-19 pandemic hit the United States in earnest, it sparked a liquidity and funding panic for financial institutions and markets. Normal market functioning has largely returned, but only with continuing monetary and fiscal support. The primary vulnerability was, and still is, co-dependencies among some debt issuers and investors whose actions during crises tend to amplify liquidity

and funding squeezes and produce spillovers among the affected markets.

FINANCIAL INSTITUTIONS

When lenders lose confidence in borrowers, they can curb funding. Banks and other types of financial firms are vulnerable to funding risk given their role as short-term borrowers and long-term lenders. In 2020, however, it wasn't just confidence in borrowers that was an issue. It was also that investors held onto their cash rather than buy more debt instruments.

Banks mostly avoided funding and liquidity problems this year. One reason is that large banks maintain liquidity buffers that generally exceed regulatory requirements calibrated to withstand

up to 30 days of financial stress. Deposits, which are relatively more stable than wholesale funding, also flowed into banks.

In contrast, some nonbank financial entities experienced temporary challenges managing liquidity.⁷² For example, some prime money market funds experienced unusually high customer redemptions. Under ordinary circumstances, money market funds experiencing significant liquidity demands would have met those demands by drawing on cash and cash equivalents, income earned on investments, and temporary lines of credit, or by selling securities with embedded gains or that are trading close to their par value. However, before the Federal Reserve's Money Market Mutual

Fund Liquidity Facility (MMLF) was initiated, some prime institutional money market funds turned to their sponsors for liquidity support.⁷³ The MMLF provided loans to banks to finance purchases of eligible assets from prime and municipal funds. Once the MMLF was established, several money market funds sold securities to affiliated and unaffiliated financial institutions via the facility to raise liquidity to meet redemptions while also maintaining weekly liquidity ratios above the regulatory minimum of 30 percent.⁷⁴

Liquidity crises tend to get worse when investors anticipate potential net asset value declines or redemption gates, and increase their redemptions accordingly. As a result, the MMLF played an important role in helping money market funds maintain high asset liquidity essential for meeting redemption demands. But, as discussed later in this section, the liquidity problem for money market funds spilled over into funding problems for commercial paper issuers because money market funds are one of the largest classes of investors in these assets.

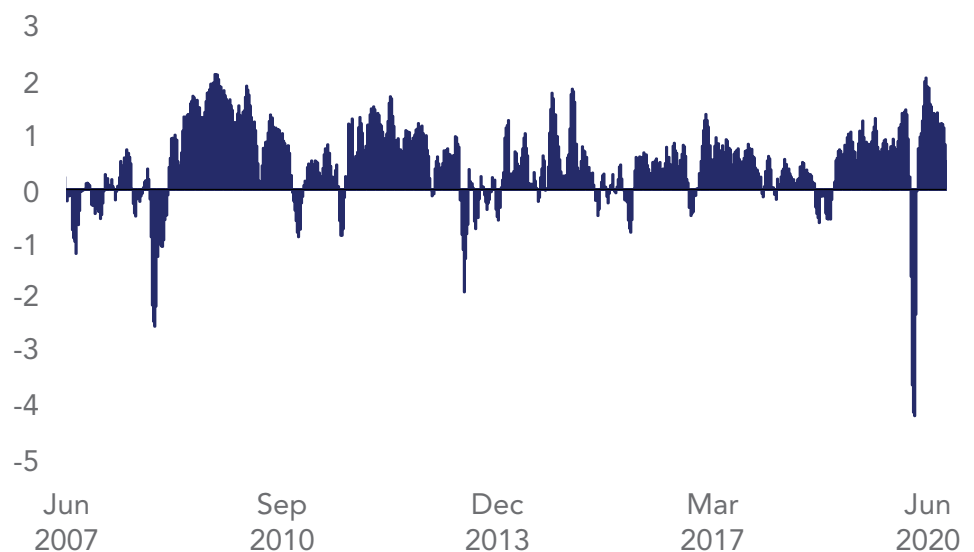
Bond mutual funds and exchange-traded funds also experienced liquidity challenges in March, in part driven by concerns about the credit quality and liquidity of fund holdings. These funds were invested in high-yield assets, investment-grade corporate debt, and sovereign debt. Bond funds recorded the sharpest outflows since the 2007-09 financial crisis, with nearly a 3 percent outflow rate across bond open-ended mutual funds and exchange-traded funds over just a few weeks (see **Figure 54**). This outflow occurred much more quickly than during the 2007-09 crisis, when there was a

3.5 percent outflow over 16 weeks. The Federal Reserve's Secondary Market Corporate Credit Facility addressed the illiquidity of this market.

The Federal Reserve's actions restored liquidity in the financial system. Fund outflows soon shifted to inflows. However, given the uncertainty still surrounding the course of the pandemic, liquidity risk remains elevated for funds providing investors with ready access to their money.

Real estate lenders, investors, and mortgage servicers have faced a different set of funding

Figure 54. Bond and Exchange-traded Funds Experienced Sharp Outflows, Then Stabilized (percent)



Note: Trailing four-week net flow rates for U.S. bond mutual funds and exchange-traded funds.

Sources: EPFR Global, Haver Analytics, Office of Financial Research

and liquidity challenges. Some of the problems were brought on by mortgage-backed securities market disruption. Other problems were brought on by forbearance policies that allowed borrowers to delay payments. Liquidity and funding problems were most acute for nonbank mortgage lenders and servicers, which unlike banks do not have access to loans via the Federal Reserve discount window.

Nonbank mortgage lenders get most of their funding for mortgages from warehouse loans. A warehouse loan is a line of credit, usually with a bank. Warehouse lending involves two stages. In the first stage, the nonbank lender uses the mortgage as collateral to draw on the warehouse line. In the second stage, the nonbank is responsible for finding a buyer for the mortgage it used as collateral. Once the mortgage is sold, the proceeds are paid to the warehouse lender, which then releases the mortgage collateral.

Disruptions in the MBS market that dry up investor demand and thus hinder new MBS issuance quickly expose these lenders to “pipeline risk.” This is the

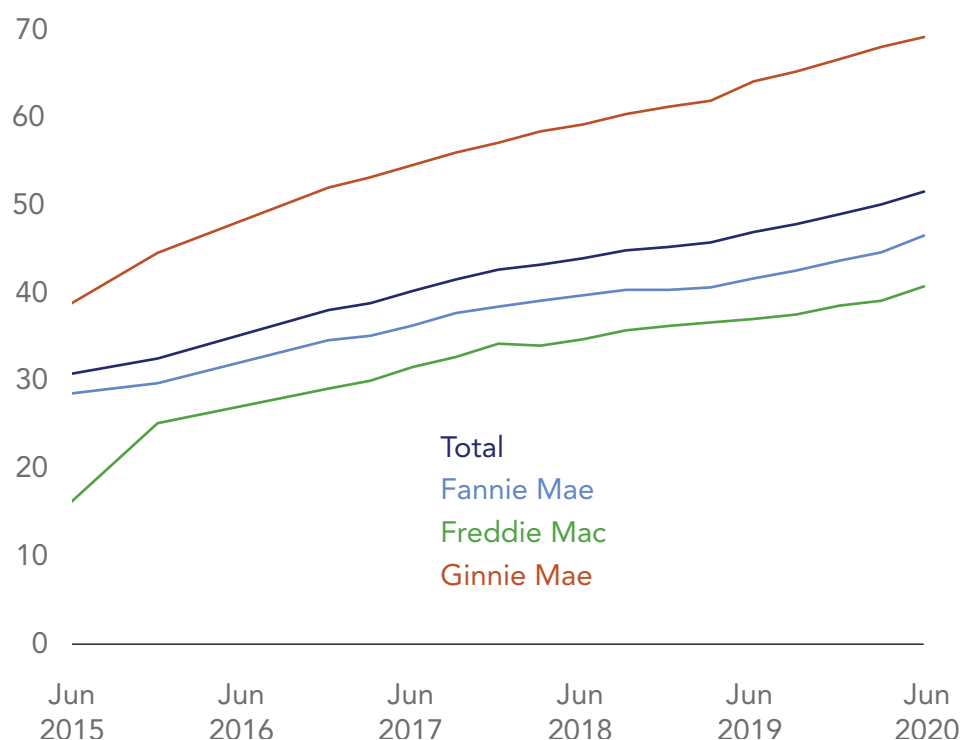
risk that they are stuck holding and funding loans on their balance sheet longer than planned. Their reliance on rapid securitization compounds this risk.

Many mortgage lenders hedge their new-loan pipelines with short positions in the MBS market. The Federal Reserve’s purchases of MBS restored the market, but also contributed to MBS price gains that led to large margin calls to mortgage lenders on their short positions.

Nonbank financial firms now service more than half of agency residential mortgages, collecting payments on behalf of investors (see **Figure 55**). These firms face liquidity risk from a mismatch between the timing of their cash inflows and outflows made worse by the pandemic and the policy response to assist borrowers.

The CARES Act requires mortgage servicers to grant payment forbearance to borrowers who are experiencing financial

Figure 55. Nonbank Share of Agency Mortgage-backed Security Servicing (percent)



Note: Data as of June 30, 2020.

Sources: Inside Mortgage Finance, Office of Financial Research

hardship and who have mortgages backed by the government or by Fannie Mae and Freddie Mac. Forbearance can be granted for 180 days and extended for an additional 180 days.

The share of residential mortgage loans in forbearance has been declining from peak levels reached in May. Mortgages in Ginnie Mae-guaranteed securities, which include FHA and VA loans, have the highest percentage of loans in forbearance at 9 percent as of September (see **Figure 56**). Mortgage

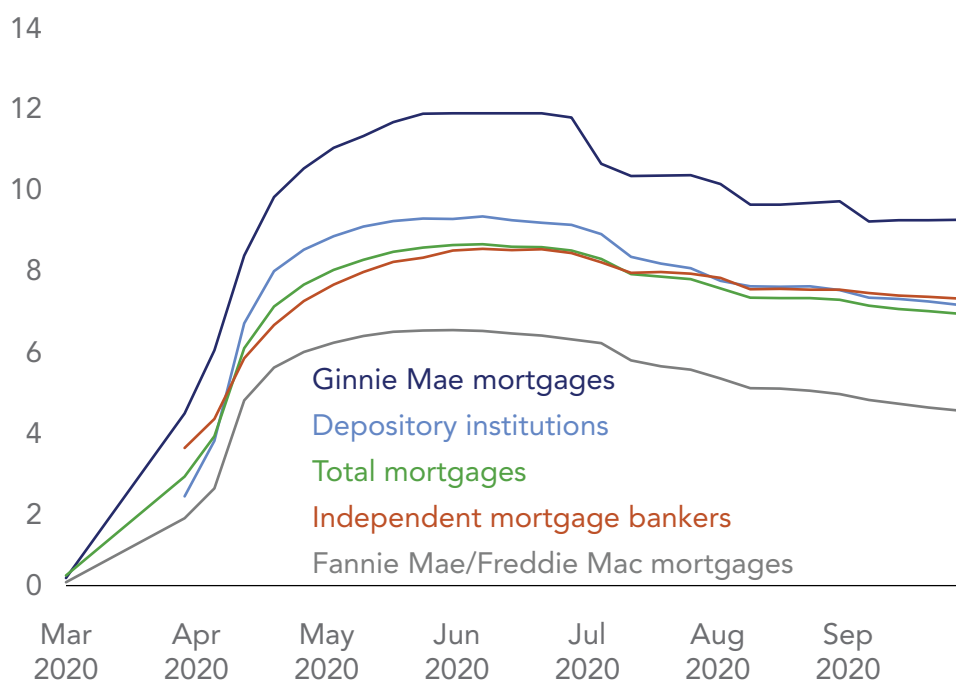
servicers are generally required to advance principal and interest payments to investors even if servicers receive no payments from borrowers for loans in forbearance. These advances strain the liquidity of nonbank servicers without other sources of revenue. The agencies adopted special pandemic-related provisions to ease those strains. Ginnie Mae established backstop financing for its servicers to mitigate this risk. Fannie Mae and Freddie Mac require servicers to provide

up to four months of advances, capping the risk.

Real estate investment trusts that invest in residential and commercial MBS also experienced liquidity problems brought on by the MBS market turmoil. Some REITs had difficulty selling MBS in the secondary market or meeting margin calls. Generally, highly leveraged REITs finance their MBS assets with repurchase agreements (repos). Federal Reserve MBS purchases offered only partial relief to this market because the purchase program does not apply to most mortgage REIT holdings. Some mortgage REITs experienced substantial market value declines in March, with some of the largest REITs losing between 12 percent and 69 percent of their market capitalization from January to mid-March. In many cases, values recovered only partially by summer.

Liquidity tightened in the MBS market, in part, due to selling pressure from REITs experiencing funding stress. The Federal Reserve's announcements during the week of March 16 resolved the liquidity squeeze affecting the MBS market.

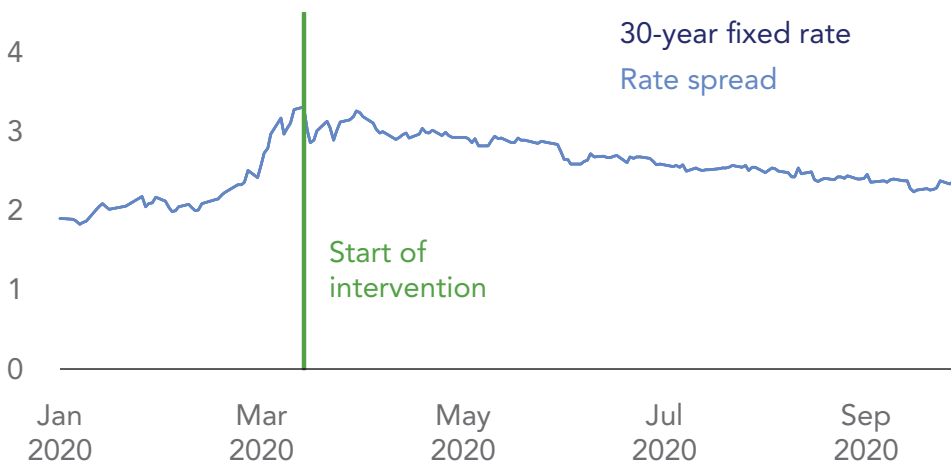
Figure 56. Residential Mortgage Servicers Saw Improving Shares of Loans in Forbearance (percent)



Note: Data as of Sept. 27, 2020. Share of residential mortgage loans in forbearance, by percent of servicers' portfolio.

Sources: Mortgage Bankers Association Forbearance and Call Volume Survey, Office of Financial Research

Figure 57. Mortgage Rates Decline After Federal Reserve Intervention (percent)



Note: The ICE BaML Bond index is the Corporate Master Total Return Bond Index.

Sources: Intercontinental Exchange, Standard & Poor's, Haver Analytics, Office of Financial Research

By summer, mortgage rates were at historic lows (see **Figure 57**).

The Federal Home Loan Banks (FHLBs) increased their exposure to funding risk in 2020. Specifically, the gap between the maturity of FHLB borrowing and lending widened further in 2020 (see **Figure 58**).

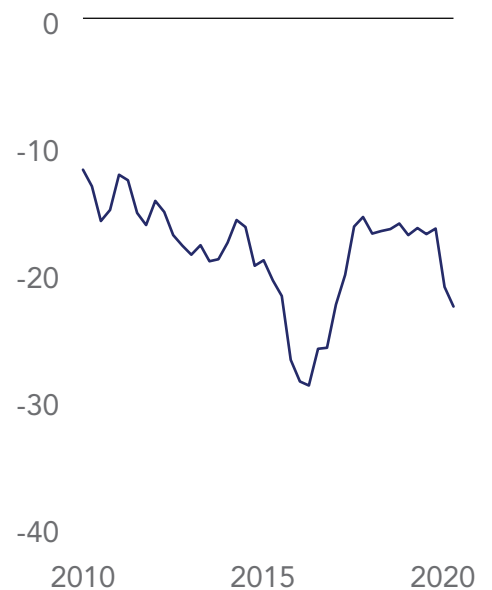
The combined assets of the FHLBs fell by 9.7 percent from year-end 2019 to the end of June, driven by a decline in advances.⁷⁵ The FHLBs provide advances — loans secured by eligible collateral, such as residential mortgages — to their bank and nonbank members. FHLB advances declined by 30.9 percent

during the second quarter — the largest percentage decline in any quarter in at least 13 years. However, this decline followed a first-quarter increase of 25.8 percent as members sought liquidity. The second-quarter decline was, in part, the result of maturing or prepaid short-term advances amid improved financial market conditions.

FINANCIAL MARKETS

A market is said to be liquid when buyers and sellers can easily trade significant volumes of financial instruments without much price impact. An illiquid market risks fire sales — when participants can't sell securities without adding

Figure 58. FHLBs' Estimated Funding Gap Widened Further in 2020 (percent)

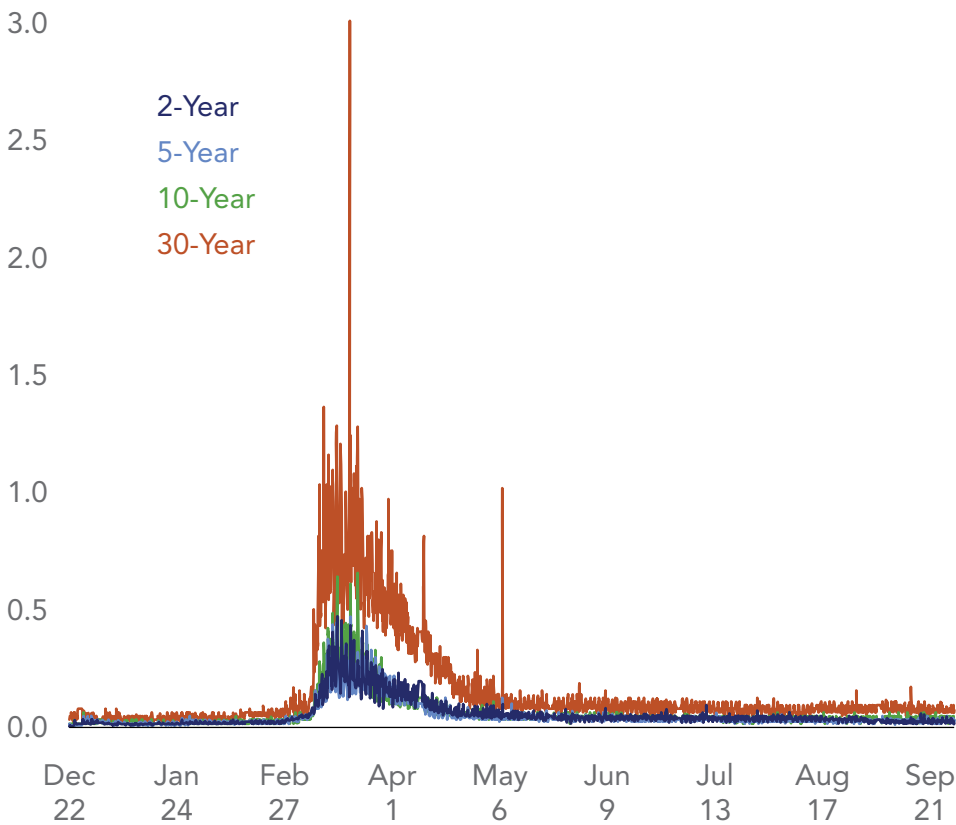


Note: Data as of June 30, 2020. FHLB stands for Federal Home Loan Bank. The funding gap equals liabilities due in one year less liquid assets, with the result divided by total assets. A 2 percent discount was applied to securities inventory and a 100 percent haircut was applied to fixed assets, held-to-maturity securities, and held-to-maturity mortgages with legal maturities greater than one year.

Sources: FHLB 10-K and 10-Q filings, Haver Analytics, Office of Financial Research

distortionary downward price pressures — and also can lead to funding problems, when lenders won't advance money. A key characteristic of a liquid market is when the price the buyer wants to pay (the bid) and the price at which the seller is willing to sell (the ask) are not far apart. This is called a narrow spread and it is a characteristic of the

Figure 59. Bid-ask Spreads for Off-the-run Treasuries Spiked in March (\$)



Note: Spreads are the difference between bid and ask prices for \$100 notional in the fourth-from-most-recent Treasury issuance as of January 2020.

Sources: Bloomberg Finance L.P., Office of Financial Research

U.S. Treasury market, the most liquid market in the world. However, in March, liquidity in the Treasury market deteriorated on sustained selling pressure. Around March 3, spreads rapidly widened, especially bid-ask spreads for longer-maturity off-the-run Treasury securities (see **Figure 59**).

Off-the-run Treasury securities are outstanding notes issued before the most recent, and most traded, on-the-run Treasury

securities. The price of on-the-run Treasuries rose relative to comparable maturity off-the-run Treasuries, reflecting an increasing difference in liquidity. Similarly, the price of Treasury securities eligible for delivery to satisfy the obligations of a futures contract rose relative to comparable maturity Treasuries not eligible. As with on- and off-the-run securities, this increasing price difference between eligible and

ineligible securities reflects an increasing difference in liquidity for these two otherwise similar securities.

The immediate cause of illiquidity was large Treasury sales to dealers, whose balance sheets were already stretched leading into March. Between January 2018 and January 2019, primary dealer net coupon Treasury exposure more than tripled, from \$66 billion to \$199 billion. Throughout 2019, that primary dealer exposure remained high and as of January 2020 was \$162 billion. By March 18, this number had risen to \$222 billion. This high Treasury exposure makes it difficult for dealers to make markets, because the intraday trading activity requires taking on additional Treasury exposure, which when exposures are already high may pose challenges to the dealer's risk. Sales by other Treasury investors to dealers were behind this increase in exposure. These sales generally appear to have been concentrated in off-the-run securities, as investors sought the liquidity of cash and Treasuries that could more easily be sold for cash. Although a variety of

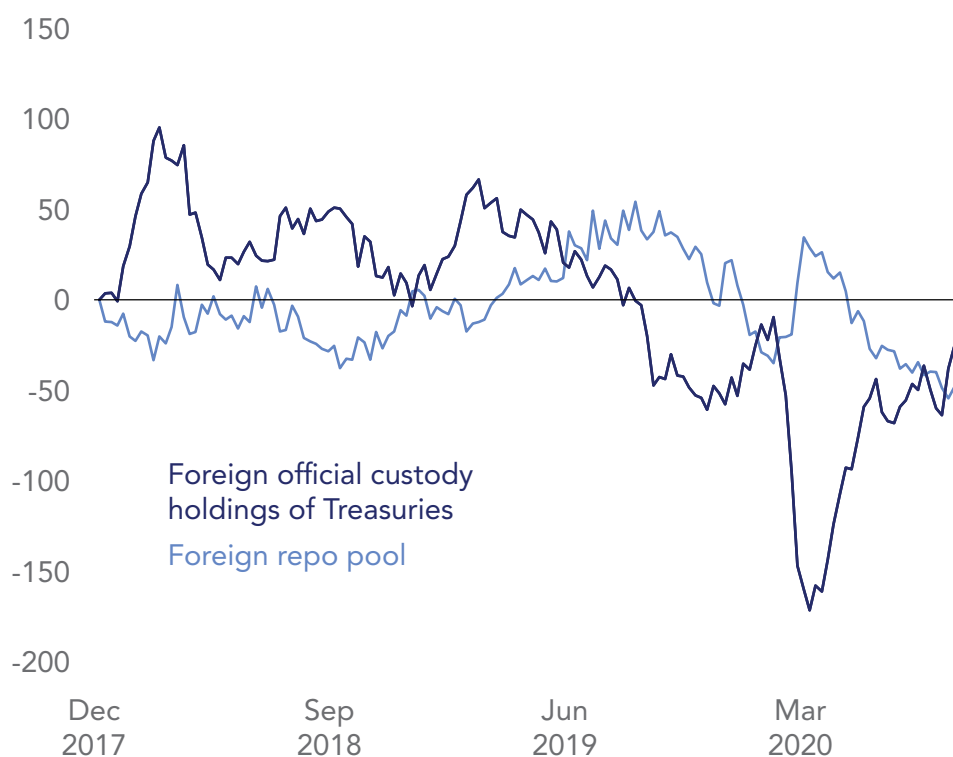
Treasury investors sought to sell their holdings, two sources of sales illustrate important vulnerabilities in the Treasury market.

First, sales by domestic and foreign “real money” investors, which consist of nonbanks and foreign central banks, played a key role. Federal Reserve data show that mutual fund Treasury positions decreased by \$196.8 billion between the fourth quarter of 2019 and the first quarter of 2020. This decrease may have been the result of redemptions by mutual fund investors, and little was picked up by other domestic nonbank actors such as pension or insurance funds. Sales by foreign official accounts appear to have been particularly large. Treasury International Capital data show a total decrease in foreign Treasury holdings of \$257 billion, with \$147 billion in sales from official accounts. Examining the Federal Reserve’s releases on these foreign official accounts’ custody holdings of Treasuries provides a higher-frequency view (see **Figure 60**). Between February 26 and March 18 of 2020, these accounts’ custody holdings of

Treasuries decreased by \$85 billion, with a further decrease of \$51 billion between March 18 and March 25. Sales by foreign official accounts may have been particularly deleterious for dealers because primary dealers are required to make reasonable markets for sales by official accounts. The effect of these foreign official sales was compounded by the investment of much of the proceeds in the Federal Reserve’s Foreign Repo

Pool, which effectively removes reserves from the domestic financial sector; if all else is equal, this makes funding Treasury holdings through repurchase agreements more expensive for dealers. The general increase in reserves over this period may have eased these effects on repo rates. Sales by foreign official accounts slowed after the Federal Reserve introduced its FIMA Repo Facility and expanded availability of swap lines, moves that let

Figure 60. Foreign Official Treasury Holdings in Custody with the Federal Reserve and the Foreign Repo Pool (\$ billions change from 2018)



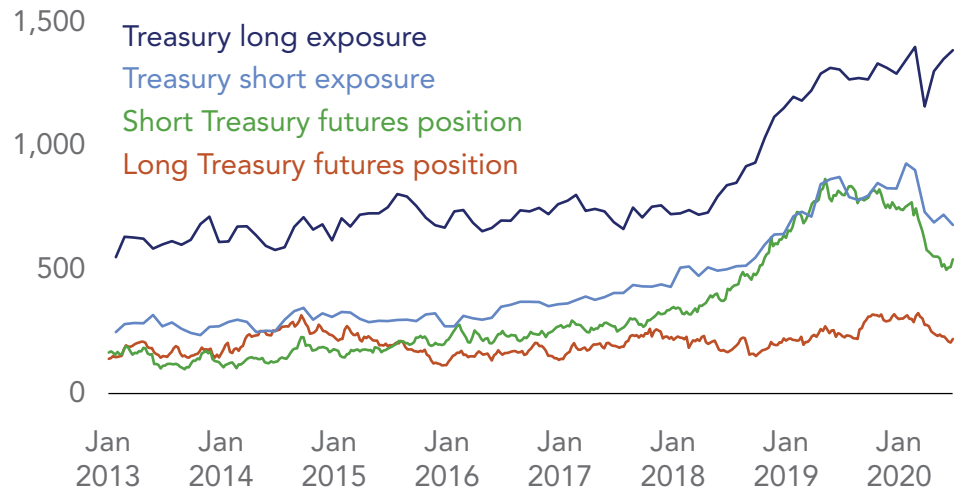
Note: Data are from Federal Reserve Release H.4.1 and are changes from level at the beginning of January 2018. Repo stands for repurchase agreements.

Sources: Board of Governors of the Federal Reserve System, Office of Financial Research

foreign official accounts get cash without selling Treasuries.

A second factor that may have contributed to the Treasury market's reduced liquidity was securities selling among hedge funds to meet margin calls (see **Market Risk**). Long Treasury exposure for hedge funds, which is profitable when prices rise, fell by \$242 billion (17 percent) during March, while short Treasury exposure, which is profitable when prices fall and largely represents short exposure to Treasury futures, fell by \$170 billion (19 percent) (see **Figure 61**). The decline in long exposure was concentrated among more levered funds (see **Figure 62**). The \$203 billion (19 percent) decline in gross long exposures in the highest leverage group (those in the top 10 percent by leverage) is likely, in part, declines in positions due to sales by hedge funds involved in cash-futures Treasury basis trades. This type of trade seeks to exploit the price difference between cash Treasury securities and Treasury futures, and much of hedge fund short Treasury exposure is associated with short futures positions. If

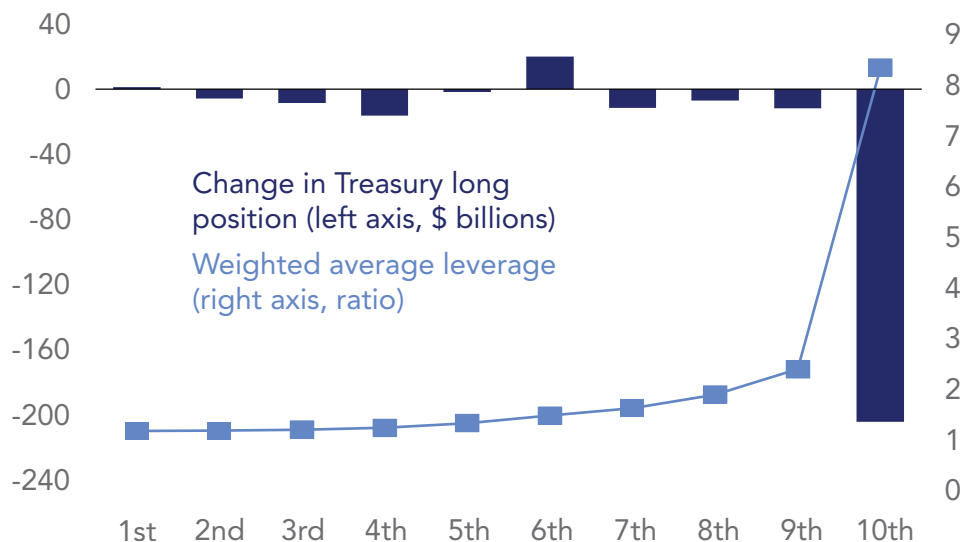
Figure 61. Hedge Fund Treasury Exposure and Futures Positions (\$ billions)



Note: Data as of June 30, 2020. Long and short Treasury exposures are from SEC Form PF, aggregated over all reporting hedge funds. Futures positions are from Commodity Futures and Trading Commission (CFTC) Commitment of Traders data, and are leveraged fund long and short positions measured as dollars of notional value.

Sources: CFTC Commitment of Traders, Securities and Exchange Commission Form PF, Office of Financial Research

Figure 62. Change in Long Treasury Position During March 2020 by Leverage Deciles (\$ billions, ratio)



Note: Deciles of leverage are determined as of December 2019. Leverage is gross asset value over net asset value. Averages are weighted by net asset value within deciles. Change in Treasury position uses gross long Treasury positions as of the end of March less gross long Treasury positions as of the end of February.

Sources: Securities and Exchange Commission Form PF, Office of Financial Research

this difference is bigger than the cost of buying the Treasury security and financing that purchase in the repo market, then the trade is profitable. These trades achieve high leverage through repo borrowing. OFR research casts some doubt on how central hedge fund sales of the cash-futures basis specifically were to amplifying Treasury market illiquidity.⁷⁶ However, selling was high across many other hedge fund strategies.

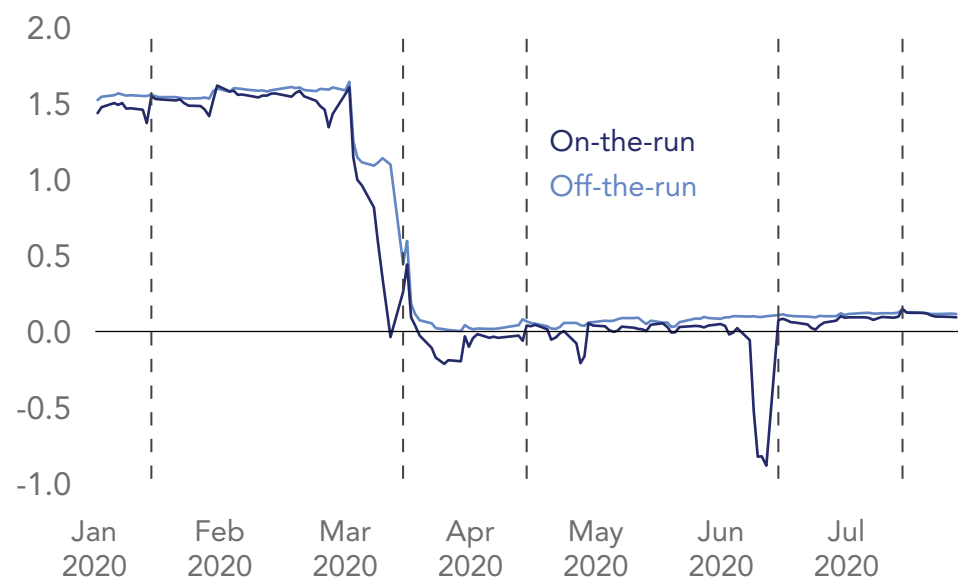
Treasury market liquidity normalized after the Federal Reserve addressed supply-demand imbalances, first by expanding its repo facility to reduce dealers' carrying costs. Reducing these costs made it more feasible for dealers to buy and hold additional Treasuries on their balance sheets, expanding these balance sheets in the process. Through its normal repo operations, the Federal Reserve makes loans to primary dealers collateralized by eligible securities such as Treasuries. Second, the Federal Reserve began directly buying Treasuries to offset selling pressure. The Federal

Reserve also temporarily lowered regulatory capital requirements that reduced the capacity of dealers to purchase the unusually large volume of Treasury securities being sold.⁷⁷

Sustained illiquidity in the Treasury market also distorted repo rates, especially in markets where lenders can specify the exact collateral they receive, such as the DVP Service run by the Fixed Income Clearing Corporation. The relatively high prices of on-the-run Treasuries made shorting Treasury securities through

reverse repos attractive. These transactions are risky for dealers. To short an on-the-run Treasury, a dealer engages in a reverse repo, bringing in the on-the-run Treasury by lending cash at a low — often negative — special collateral rate. The dealer rolls the transaction over until the on-the-run Treasury can be secured. If the dealer fails to secure the Treasury, or if borrowers with that security are unavailable, the dealer is subject to both a charge for failing to deliver the Treasury security and the loss of the money the dealer lent against

Figure 63. Average DVP Repo Rate by Collateral Runness (percent)



Note: Data as of July 28, 2020. Average rates for overnight repurchase agreement (repo) transactions via the Fixed Income Clearing Corporation's DVP Service using on-the-run or off-the-run Treasuries as collateral. Dashed lines denote reopenings of the 10-year note and 30-year bond.

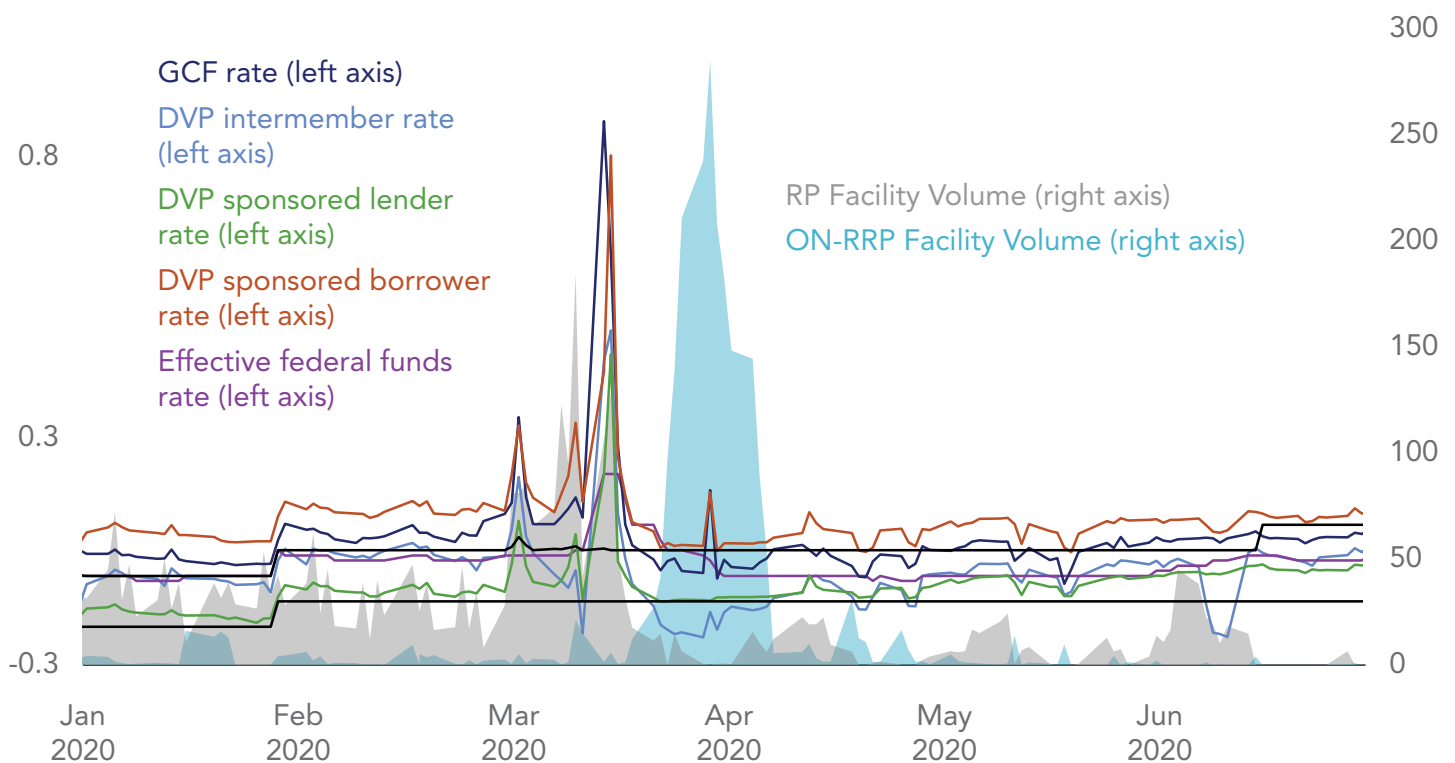
Sources: OFR Cleared Repo Collection, Office of Financial Research

the security. The volume of these special collateral transactions, known as specials, led to negative average rates in some sections of the repo market (see **Figure 63**). Specials activity has been especially high directly preceding reopening of the 10-year and 30-year Treasury securities, when dealers can rely on the supply of the on-the-run Treasury increasing in the near future.

These special collateral transactions took place amid broader stress in cleared repo markets, which in the United States include the Fixed Income Clearing Corporation’s DVP Service, a bilateral market, and GCF Repo Service, a tri-party market with only general collateral trades. Repo rates in March experienced high levels of volatility during the general flight to liquidity (see **Figure 64**). Leading into March 17, repo rates in

cleared markets increased dramatically, especially in the DVP Service’s sponsored borrowing market and the GCF Repo Service. The effective federal funds rate followed the increase in repo rates, rising to meet the upper bound on the target range. With the March 17 expansion of the Federal Reserve’s repo facility, which lends to dealers, these rates broadly fell, eventually meeting the lower bound set by

Figure 64. Overnight Spreads Over Federal Funds Target and Volume in Federal Reserve Facilities (percent, \$ billions)



Note: Data as of July 28, 2020. Rates for the Fixed Income Clearing Corporation’s DVP Service and GCF Repo Service, two venues for repurchase agreement (repo) transactions, are weighted average overnight rates for Treasury collateral. The two black lines show the average rate offered by the Federal Reserve’s Repo Facility (RP, upper line) and Overnight Reverse-Repurchase Facility (ON-RRP, lower line). The shaded areas are daily transaction volumes in these facilities.

Sources: Board of Governors of the Federal Reserve System, Federal Reserve Bank of New York, OFR Cleared Repo Collection, Office of Financial Research

the reverse-repo facility. While the movements in facility volumes were large throughout late March and early April, the Federal Reserve appears to have been broadly successful in its control of rates. Since May, rates have begun to slowly increase, and participation in these facilities has broadly fallen.

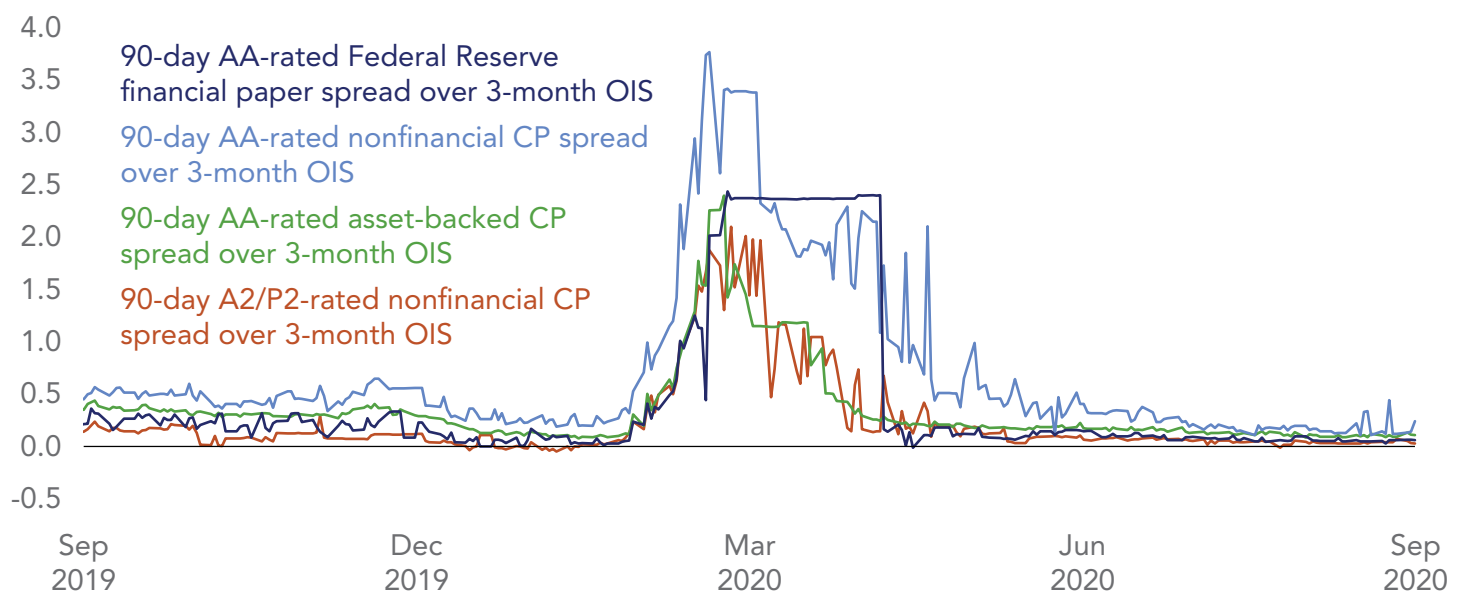
Liquidity fell and rates spiked in other short-term funding markets, too. Prime money market funds sought to reduce their commercial paper holdings and raise cash to meet investor redemptions. Also, securities lending cash collateral reinvestment accounts reduced

commercial paper holdings by nearly 30 percent in first quarter 2020. At the same time, commercial paper issuers, particularly nonfinancial companies with few alternative sources of short-term funding, experienced greater short-term funding needs under the stress of the pandemic. The Federal Reserve's Commercial Paper Funding Facility allowed issuers to buy back their outstanding commercial paper and reissue it. This facility reduced funding stress for most issuers. However, the facility does not address funding pressures of lower-credit-quality commercial paper issuers or support secondary market liquidity.

Conditions in short-term funding markets gradually improved, with three-month commercial paper rates returning to typical spreads above overnight indexed rate swaps (see **Figure 65**). This spread is a proxy for stress induced by firms' collective need to draw on their bank lines of credit in place of issuing commercial paper. The A2/P2 rate applicable to lower credit-quality issuers was the last commercial paper rate to normalize.

The market's problems in March were very different from those experienced during the 2007-09 crisis, when asset-backed commercial paper was

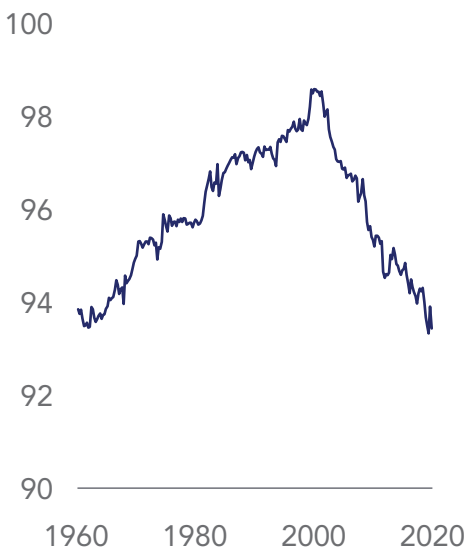
Figure 65. Three-month Commercial Paper (CP) Interest Rate Spread over the Overnight Indexed Swap (OIS) Rate (percent)



Sources: Federal Reserve Bank of New York, Bloomberg Finance L.P., Office of Financial Research

issued to fund risky residential mortgage-backed securities. Disruptions experienced in 2020 affect all types of investment-grade firms dependent on commercial paper for their short-term funding needs, both financial and nonfinancial.

Figure 66. Financial Sector Leverage Is Low (percent)



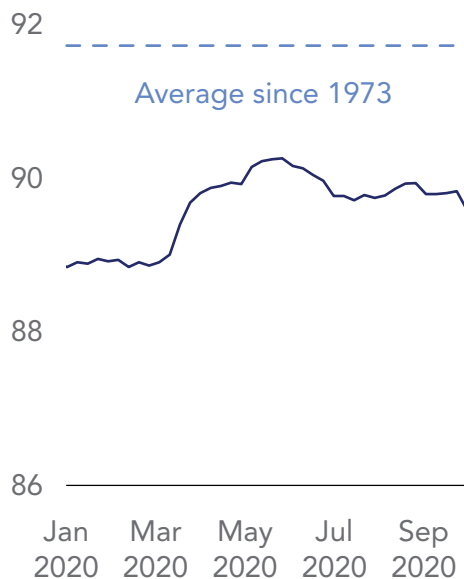
Note: Data as of June 30, 2020 and are from Federal Reserve Release Z.1. Leverage measured as total liabilities over total financial assets of the financial sector.

Sources: Board of Governors of the Federal Reserve System, Haver Analytics, Office of Financial Research

LEVERAGE IN THE FINANCIAL SYSTEM

Use of debt has the potential to increase returns, yet it can also compound losses from risks already discussed. Higher leverage is associated with a higher risk of insolvency. Financial sector leverage ticked up in the first quarter of 2020, but remains relatively low for the post-World War II period (see **Figure 66**). The change in 2020 reflects a reversal of trends since the 2007-09 crisis. Banks increased

Figure 67. Bank Leverage Rises (percent)



Note: Data are from Federal Reserve release H.8. Shows commercial bank liabilities as a percentage of total assets.

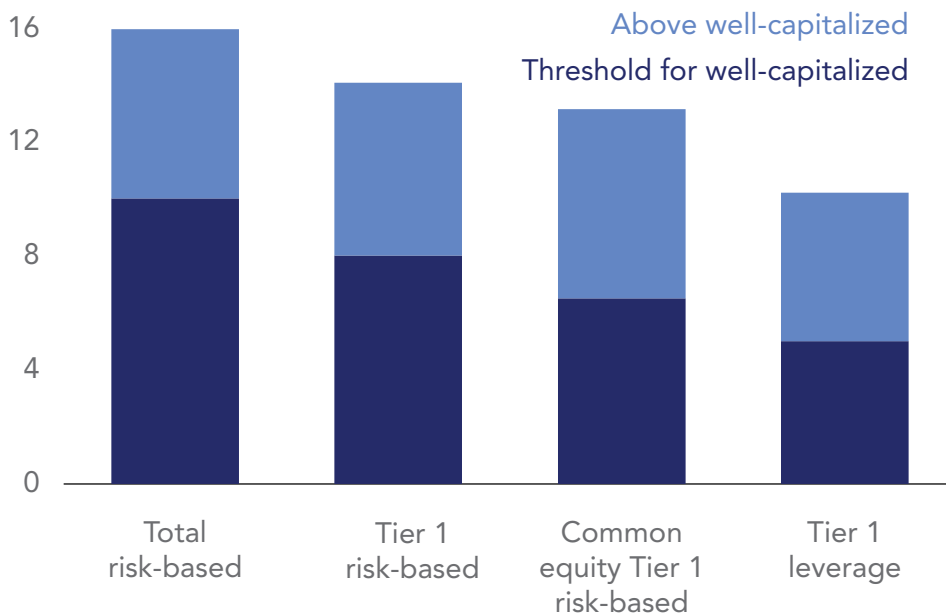
Sources: Board of Governors of the Federal Reserve System, Haver Analytics, Office of Financial Research

leverage in the first quarter while hedge funds deleveraged.

BANKS

Bank leverage increased moderately in the spring, along with increases in loans and deposits, but remains lower than the average since 1973 (see **Figure 67**). As of June 30, 2020, bank holding companies maintained regulatory capital ratios about 1.5 times to 2.2 times above what is considered by regulators to be well-capitalized (see **Figure 68**). Larger banks, particularly the global systemically important banks (G-SIBs), hold additional capital, some of which is specified by regulation. High capital buffers going into this crisis help to ensure that banks can continue supporting the economy through lending without materially increasing risk to stability of the banking system (see **Financial Firm Insolvency Risk and Potential Contagion**). Even so, the Federal Reserve has effectively temporarily lowered the amount of required capital as an additional way of ensuring that banks can increase their lending.⁷⁸ Specifically,

Figure 68. Average Bank Holding Company Capital Ratios Are Much Above Well-capitalized (percent)



Note: Data as of June 30, 2020, and are from Federal Reserve Forms Y-9C. Risk-based ratios are based on regulatory definitions of common equity Tier 1, Tier 1, and total capital divided by risk-weighted assets. The leverage ratio is Tier 1 capital divided by adjusted total assets. The definition of “well capitalized” is based on the FDIC’s Prompt Corrective Action (PCA) guidelines. While this standard applies to insured depositories, it is used as a proxy for bank holding companies.

Sources: Federal Deposit Insurance Corporation, Board of Governors of the Federal Reserve System, Office of Financial Research

the Federal Reserve allows banks to which its rule is applicable to temporarily exclude reserves and Treasury securities from the denominator when calculating their supplementary leverage ratio requirement.

INSURANCE COMPANIES

Insurers began 2020 with healthy levels of risk-based capital (see **Figure 69**). Generally, these capital cushions serve as buffers

against unexpected insurance underwriting losses, investment impairments, or other adverse developments. Bond rating downgrades and defaults would strain insurers’ investment portfolios and lead to higher required capital charges. Life insurers’ investment and credit risk account for more than half of their total required capital.

Leverage for each of the insurance sectors remains

Figure 69. Insurer Risk-Based Capital (percent)

	2017	2018	2019
Life	465	420	430
Property & casualty	312	308	312
Health	304	310	312

Note: Values reflect average actual amounts of adjusted capital as a percent of risk-based capital required for each category.

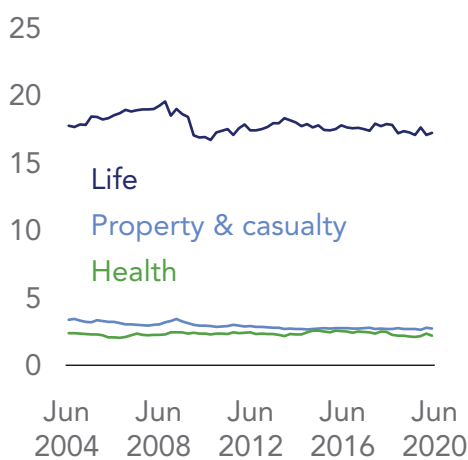
Sources: Insurer statutory filings, S&P Global Market Intelligence, Office of Financial Research

fairly consistent over time. The current leverage is lower than the levels leading up to the 2007-09 financial crisis. Leverage at life insurers remains consistently higher than that of property and casualty or health insurers (see **Figure 70**).

HEDGE FUNDS

Hedge funds can affect the stability of financial markets when they make drastic changes to their investment positions. Hedge funds invest heavily in risky asset classes such as equities, corporate credit, and commodity futures. Market effects can be particularly pronounced for large funds that are more leveraged. As a result, changes in hedge

Figure 70. U.S. Life Insurers Have Higher Leverage Than Other Insurers (ratio)



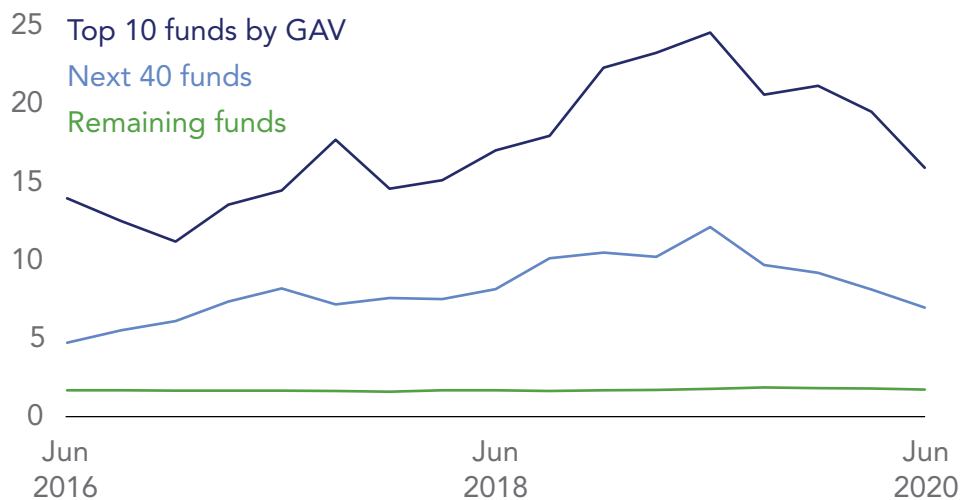
Note: Data as of June 30, 2020. Leverage is the ratio of assets to policyholder surplus, which is the difference between an insurer's assets and its liabilities.

Sources: Insurer statutory filings, S&P Global Market Intelligence, Office of Financial Research

fund leverage serve as an indicator of changes in the risk hedge funds can pose to financial stability.

Average leverage for the 10 largest hedge funds, measured as the average ratio of gross assets (the market value of assets on a fund's balance sheet) to net assets (the value of investors' equity), peaked at 24.6 in June 2019 and fell to 15.9 as of June 2020 (see **Figure 71**). Leverage also fell significantly for the next 40 largest funds. For the remaining funds, there has been little change. The overall decline in leverage,

Figure 71. Hedge Fund Leverage by Size (ratio)



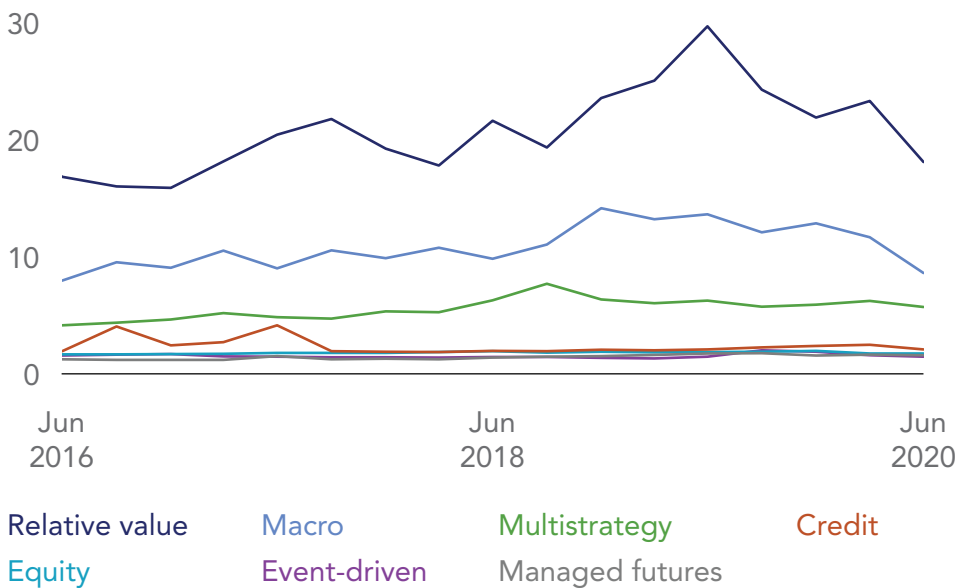
Note: Data as of June 30, 2020. GAV stands for gross asset value. Leverage ratio is defined as GAV divided by net asset value as reported on Form PF Questions 8 and 9. Size cohorts are based on rankings by GAV

Sources: Securities and Exchange Commission Form PF, Office of Financial Research

coinciding with the negative hedge fund performance early in the COVID-19 pandemic, can be partly attributed to the decision making of hedge funds engaging in relative value and macro strategies (see **Figure 72**).⁷⁹ For example, in 2020 alone, relative value and macro funds reduced their leverage from 22.0 to 18.2 and 12.9 to 8.7, respectively. To assess these trends while simultaneously placing more emphasis on larger size, funds' leverage within a strategy group are weighted by their gross asset size, with the underlying assumption that larger funds pose greater financial stability risks.

Hedge fund leverage also provides information about investor flows and risk appetite. Reductions in leverage, for example, can signal current and future flows out of funds. Such outflows can be destabilizing if investment advisors are forced to sell large positions. To that end, some recent data on investor flows suggest that COVID-19-related withdrawals were significant early in the year. Based on survey data from analytics firm eVestment, roughly \$37.6 billion or 1.2 percent of total assets under management left the industry from January through August 2020. Outflows were concentrated

Figure 72. Hedge Fund Leverage by Strategy (ratio)



Note: Data as of June 30, 2020. Within a strategy, leverage is weighted by gross asset value. The leverage ratio is defined as gross asset value divided by net asset value as reported on Form PF Questions 8 and 9. A fund is assigned to a given strategy if 75 percent or more of its gross value reported on Form PF Question 20 is dedicated to that strategy. A fund is considered multistrategy if no strategy satisfies the 75 percent threshold.

Sources: Securities and Exchange Commission Form PF, Office of Financial Research

in funds that specialized in macro, long-short equity, and directional credit strategies.⁸⁰ While the percentage figure seems large, it is important to note that outflows were relatively low compared with the 2007-09 financial crisis, when some hedge fund monitors reported that more than 5 percent of assets under management left the industry.⁸¹

Several hedge fund strategies experienced significant losses in the first quarter, particularly in March. Two such

strategies were the basis trade (discussed above in **Liquidity and Funding Risk**) and risk parity strategies. Evidence suggests that Treasury market illiquidity led to significant losses at highly leveraged relative value hedge funds using the basis trade strategy.⁸² The losses might have forced some funds to unwind their trading positions. Funds with risk parity strategies also experienced large losses in March. These strategies are constructed so that the contribution of each asset's volatility to aggregate portfolio

volatility is balanced. Achieving this risk balance requires, for example, leveraging up and purchasing additional assets with lower volatility. Conversely, with higher volatility assets, less leverage is used. Although risk parity strategies are designed to exhibit more consistent performance across market environments, the market turbulence in March led to an unusual, simultaneous decline in both equity and bond prices, which caused large losses. For example, the S&P risk parity index lost 11.1 percent during March.

For both of these types of strategies, policy actions taken by the Federal Reserve and U.S. government helped alleviate stress. With respect to the basis trade, spreads narrowed and the pressure on relative value funds eased on March 16-17 as the Federal Reserve provided an additional source of demand for Treasury securities. Other policy actions, including the fiscal stimulus package in late March, contributed to easing market volatility, which alleviated sell-offs across asset classes due to the risk parity strategy.

CURRENT EXPECTED CREDIT LOSS ACCOUNTING FRAMEWORK

The Incurred Loss Model (ILM) and the Current Expected Credit Loss Model (CECL) are accounting frameworks for creating provisions for credit losses. The frameworks apply to firms that prepare financial statements in conformity with U.S. Generally Accepted Accounting Principles and have certain financial assets exposed to credit risk on their balance sheets. The 2007-09 financial crisis raised concerns about the timing of loss recognition with ILM. Specifically, under the ILM, a firm provides for credit losses only when the asset is impaired as of the date of the financial statements and the firm can reasonably estimate the size of the loss. While this was in accordance with accounting guidance under the ILM, the increased provision expense reduced income available to increase capital, which threatened the financial system by stressing bank capital at the worst possible time. In response, the Financial Accounting Standards Board developed CECL. In January 2020, 243 larger banks replaced ILM with CECL as planned.⁸⁸ Ten more banks adopted CECL during the second quarter.⁸⁹ For other firms, the framework takes effect for fiscal years beginning after Dec. 15, 2022, with early adoption permitted.

The ILM can limit the buildup of loss allowances early in a recession, when the economy is slowing but defaults have not risen much. The accounting standards board developed CECL in an attempt to make firms' financial reports more forward looking and better aligned with report users' needs. Under CECL, losses must be forecast over the life of any financial assets within the scope of the CECL framework, not just loans and leases. Provisions are made when credit is extended and revised on an ongoing basis. Firms estimate their credit losses based on historical experience, current conditions, and "reasonable and supportable" forecasts.⁹⁰ Firms have considerable leeway in how they develop their estimates.

Potential concerns about a reduction in lending due to adoption of CECL and the way it affects reserves have been affected by the timing of its adoption during the same quarter the COVID-19 pandemic hit. The relative effects of the pandemic and CECL adoption on reserves vary by bank. An analysis of 23 banks with more than \$50 billion in assets found that these banks' adoption of CECL at the beginning of the calendar year increased their total reserves by \$18.8 billion.⁹¹ However, that total was much smaller than the \$31.3 billion these banks set aside during the first quarter to cover expected losses associated with the recession. For other banks with more than \$10 billion in assets, reserve increases for pandemic-related losses and CECL adoption have been similar. For consumer banks (for example, credit card issuers), the impact of CECL adoption on reserves was larger than for the pandemic.

FINANCIAL FIRM INSOLVENCY RISK AND POTENTIAL CONTAGION

Credit, market, liquidity, and funding risks can all threaten the solvency of financial firms. When these risks are realized as losses, those losses can be magnified by the use of leverage. Highly leveraged financial firms are at greater risk of insolvency, and can threaten the solvency of other financial firms via their interconnections. Contagion risk, in turn, can expand with the number and complexity of financial firms' interconnections with each other.

FINANCIAL FIRM INSOLVENCY RISK

Macroeconomic and credit risks are particularly high, given the uncertainty about the pandemic's course and how households, businesses, and policymakers will react. Lenders are already feeling the effects. The FDIC reported 70 percent declines in net income for the banking industry in the first and second quarters of 2020 compared with a year earlier.⁸³ The agency

cited a decline in economic activity and an increase in loss provisioning as drivers of this earnings decline. Over the longer term, all financial firms with business models based on borrowing short term to lend long term face challenges to their solvency from low interest rate margins (see *Declining Net Interest Margins Are a Long-term Threat to Financial Institutions*). Earnings replenish capital, which mitigates the risk of insolvency.

Banks. For U.S. G-SIBs, aggregate net income declined by 59 percent from the first half of 2019 through the first half of 2020.⁸⁴ An aggregate 408 percent increase in provisions for credit losses was an important driver of this decline. Provisions, in turn, rose with banks' expectations for pandemic-related losses and the concurrent adoption of the new current expected credit loss accounting standard (see *Current Expected Credit Loss Accounting Framework*).

As a result of steps taken during the pandemic, banks also have higher operating costs and risks.⁸⁵ Heightened costs and risks are associated with:

- Greater use of teleworking and virtual services, which can increase cyber risk vulnerabilities;
- More sensitive processes performed outside of bank-owned or authorized properties and devices, which can increase the risk of fraud and potential for exposure of customer sensitive information; and
- Increased use of online and mobile systems, which may stress or adversely affect banks' telecommunications capacity.

These additional operational risks required increases in bank monitoring, oversight, and mitigation procedures. Moreover, these bank operations must keep pace with the rapid implementation of pandemic-related business continuity plans and transitioning from traditional operations to a heightened operational level. While not a likely threat to bank solvency in and of themselves, these additional costs and risks have hit banks at the same time that macroeconomic and credit risks are elevated.

The Federal Reserve's annual large bank holding company stress tests — the Comprehensive Capital Analysis and Review (CCAR) — provide an important gauge of solvency risk within the banking system and financial stability more generally. CCAR tests the robustness of banks' capital to losses that can occur during periods of financial stress. This year, in addition to its normal stress test, the Federal Reserve conducted a sensitivity analysis to assess the resilience of large banks under three hypothetical economic scenarios that could result from the COVID-19 pandemic.⁸⁶ The scenarios included a V-shaped recession and recovery; a slower, U-shaped recession and recovery; and a W-shaped, double-dip recession.

In those three scenarios, the unemployment rate peaked at between 15.6 percent and 19.5 percent, which is significantly worse than any of the Board's pre-pandemic stress test scenarios. In aggregate, loan losses for the 34 banks tested ranged from \$560 billion to \$700 billion and capital ratios declined from 12 percent in the fourth quarter of 2019

to between 9.5 percent and 7.7 percent. Under the U- and W-shaped scenarios, most banks would remain well capitalized, but several would approach minimum capital levels. The sensitivity analysis did not incorporate potential effects of government stimulus payments and expanded unemployment insurance.

In light of these results, the Federal Reserve took several actions to bolster bank resilience should macroeconomic and credit risks be worse than expected. In the second half of 2020, large banks must not repurchase their shares. In recent years, share repurchases have accounted for about 70 percent of shareholder payouts from large banks. Large banks also must limit their dividend payouts to 100 percent of the trailing four quarters of earnings. In recent years, some of the largest banks have paid out dividends exceeding their earnings. The results of this year's stress test were also used to set new capital requirements for 34 banks with assets of more than \$100 billion.

These new requirements took effect on October 1. Many smaller banks can be

at greater risk of insolvency than larger banks due to concentrations in exposures to particular risky sectors such as commercial real estate or risky industries such as oil and agriculture. When smaller banks face insolvency, local economies can suffer without posing a risk to overall U.S. financial stability.

As discussed above, an area of particular concern is banks' exposures to commercial real estate. A bank's risk of insolvency from CRE and CMBS exposures can be assessed by looking at the size of these exposures relative to the bank's capital. Large exposures — those exceeding three times tangible common equity — are concentrated among hundreds of smaller banks that hold a small, but not insignificant, portion of industry assets (see **Figure 73**). Of the 5,114 banks analyzed, 1,431 banks totaling 15.3 percent of industry assets had large CRE exposures at the end of June. When combined with their CMBS securities held in portfolio, 1,528 banks totaling 19 percent of industry assets had large exposures. That is, when CMBS are also considered,

Figure 73. Many, but Not Most, Banks Have High CRE Exposures as a Multiple of Tangible Common Equity (top) (number of banks) and Banks with High CRE Exposures as a Multiple of Tangible Common Equity Are Mostly Small (bottom) (percent of industry assets)



Note: Data as of June 30, 2020. Commercial real estate (CRE) loans and commercial mortgage-backed securities (CMBS) held in portfolio. Multiples of tangible common equity of three or more are high.

Sources: Federal Deposit Insurance Corporation, Office of Financial Research

a relatively small number of additional banks have large exposures relative to their capital. This change is reflected in the modest shift in the distribution of bank exposures from the left to the right along each figure's horizontal axis.

Insurers. Ten-year U.S. Treasury yields have fallen below 1 percent, and a prolonged low-rate environment could be likely. Insurers, particularly U.S. life insurance companies, have been facing a decline in their spread income for

some time (see **Figure 74**). A sustained period of lower interest rates exacerbates the narrowing of this spread between the amount of money the company can earn on investments and the crediting rate on insurance policies.

Insurers have tried several ways to enhance investment yields. These include extending the maturities of their investments and taking on more credit risk. They have also increased investments in less liquid and sometimes more complex securities. These include private placements, mortgage loans, and alternative investments (see **Figure 75**). Insurers, particularly life insurers, have also used securities lending and repurchase agreements, funding agreement-backed securities, and Federal Home Loan Bank borrowing to earn spread income that enhances their portfolio yields.

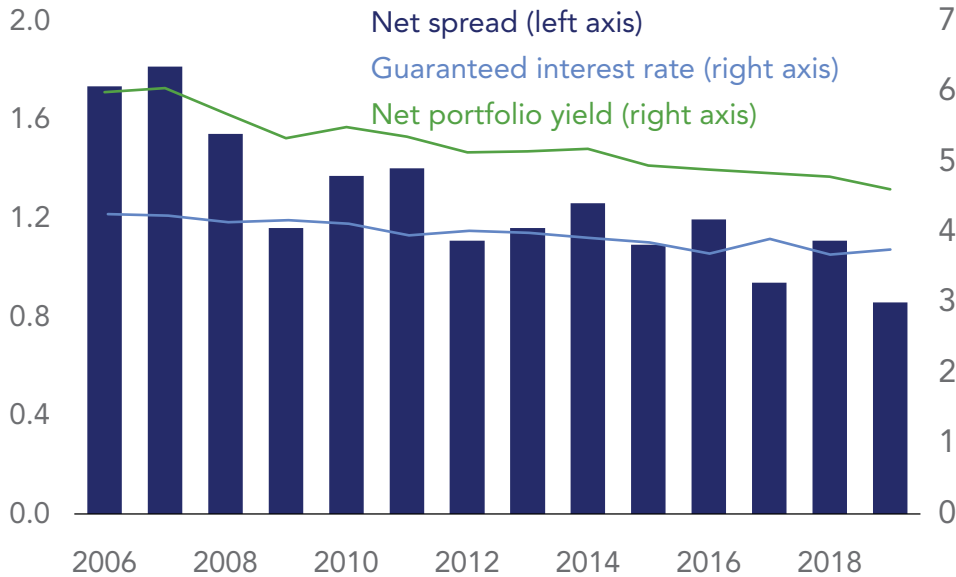
Government-sponsored enterprises (GSEs) Fannie Mae and Freddie Mac. Fannie Mae and Freddie Mac have been under conservatorship since 2008. One requirement to exit conservatorship is to maintain capital that meets

requirements that boost their resilience to future stress.

Under a proposal the FHFA issued in May, Fannie Mae and Freddie Mac would

be required to hold a combined \$243 billion of capital. This amount is based on the enterprises' financial statements dated Sept. 30, 2019, and is much larger than the \$137 billion that would have been required under a previous proposal in 2018. Fannie Mae and Freddie Mac held a combined \$27.9 billion in capital on June 30, 2020.⁸⁷

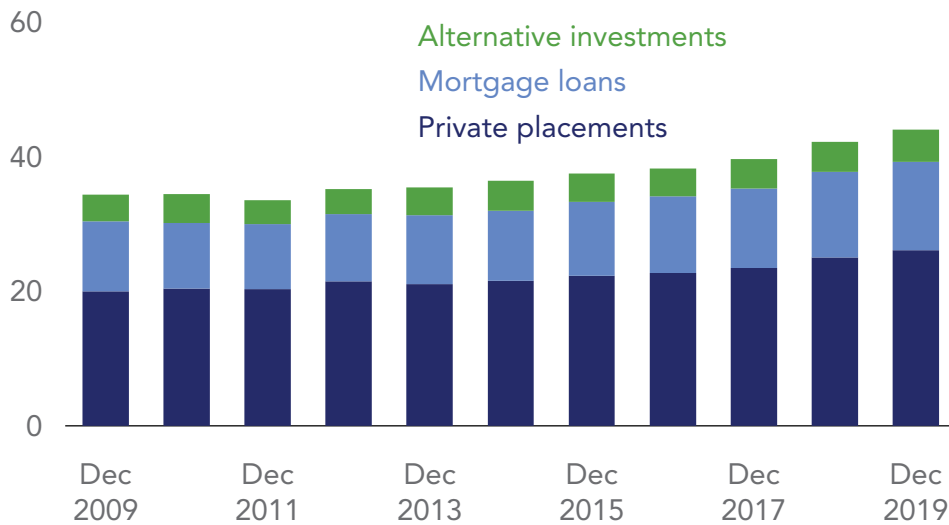
Figure 74. Life Insurance Industry Yields (percent)



Note: Net spread is the difference between the net portfolio yield and the guaranteed interest rate.

Sources: National Association of Insurance Commissioners, Office of Financial Research

Figure 75. Life Insurers Have Increased Their Less-liquid Investments (percent)



Note: Investments as a percentage of invested assets. Alternative investments include, for example, hedge funds and private equity, or specialty investments such as mineral rights and aircraft leases.

Sources: Insurer statutory filings, S&P Global Market Intelligence, Office of Financial Research

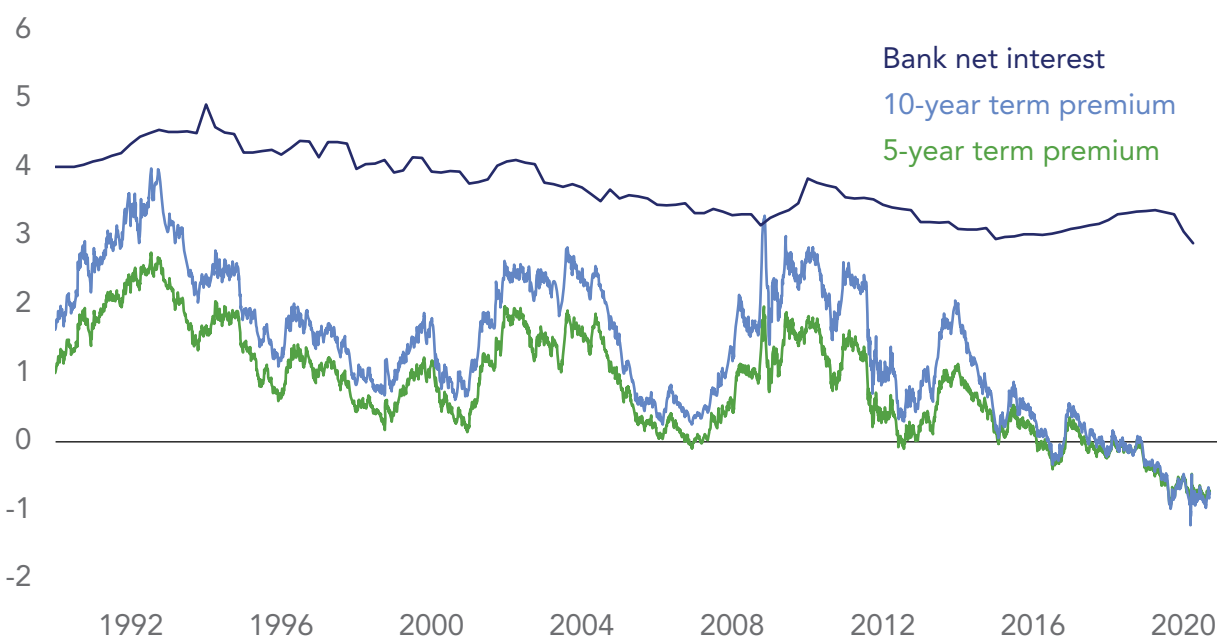
The 2020 proposal for risk-based capital uses a framework similar to that of the international Basel capital framework for banks. The 2020 proposal also includes a leverage capital requirement for the two housing GSEs. Each enterprise would have to hold the higher of the risk-based capital requirement or leverage requirement.

Under the proposed rule, Fannie Mae and Freddie Mac must hold capital that exceeds the requirements in order to avoid limits on capital distributions and discretionary bonus payments. The amount of capital the two housing GSEs would need to raise, about \$215 billion, remains an obvious issue to their potential exit from conservatorship.

DECLINING NET INTEREST MARGINS ARE A LONG-TERM THREAT TO FINANCIAL INSTITUTIONS

A combination of low expected productivity growth, low inflation risk, and increasing demand for safe assets has pushed down Treasury rates across the yield curve. Lower rates, and especially lower term premiums, could have consequences for the profitability of financial institutions. The yield curve influences the return on maturity transformation, which the term premium approximates. With short-term rates pinned by the zero lower bound and long-term rates declining, the profitability of maturity transformation has generally been declining (see **Figure 76**). At the same time, borrowing long term becomes more attractive and lending long term becomes less attractive, placing more pressure on financial intermediaries as entities such as nonfinancial firms increase the duration of their liabilities.

Figure 76. Recent Declines in Term Premiums Have Not Been Associated with Declining Bank Interest Margins (percent)



Note: Data as of Aug. 14, 2020. Term premiums are from the ACM term structure model. Net interest margin is an aggregate for all U.S. banks.

Sources: Adrian, Crump, and Moench (2013), Federal Financial Institutions Examination Council, Federal Reserve Bank of New York, Federal Reserve Bank of St. Louis, Office of Financial Research

The exposure of financial institutions to declining yield curve spreads likely depends on their source of funding. Commercial banks may be less exposed as they exercise some market power on their consumer deposits, meaning that increases in short-term rates are not fully passed through. In fact, when short-term interest rates were rising beginning in 2016, consumer deposit rates barely rose, and the aggregate net interest margin for banks increased. On the other hand, for institutions relying on wholesale funding, the effects of changes in the yield curve are much more direct. Repo rates are closely tied to short-term returns such as those on Treasury bills, and the extent to which market power can be exercised in these markets is likely limited. With the more recent increase in slopes of the yield curve, the position is reversed: for retail banks, the deposit rate paid has little room to decrease, while long-term rates continue to decline. For nonbank financial firms, the decrease in the short-term rate more directly increases the margins they can expect to earn.

CONTAGION RISK WITHIN THE FINANCIAL SYSTEM

Contagion risk is the risk that stress at one financial institution or part of the financial system spills over to others. It can arise from asset and liability exposures to other parties, or from disruptions to financial market infrastructure. Exposures among counterparties in derivatives markets and other sources of interconnection among large financial firms can be a major vulnerability. These networks of contractual relationships can spread stress and losses when shocked. The shock from the COVID-19 pandemic tested the resilience of the U.S. financial system.

The system remained functional, albeit with unprecedented government support as the Federal Reserve backstopped entire markets.

Global Systemically Important Banks. Eight U.S. bank holding companies are identified by the Financial Stability Board as G-SIBs whose failure could pose a threat to the international financial system. The OFR's Bank Systemic Risk Monitor presents a collection of key public measures for monitoring systemic risks posed by these banks and their global peers. Among those measures is the OFR Contagion Index, which computes the loss that could spill over to the rest of the financial system if a given bank were

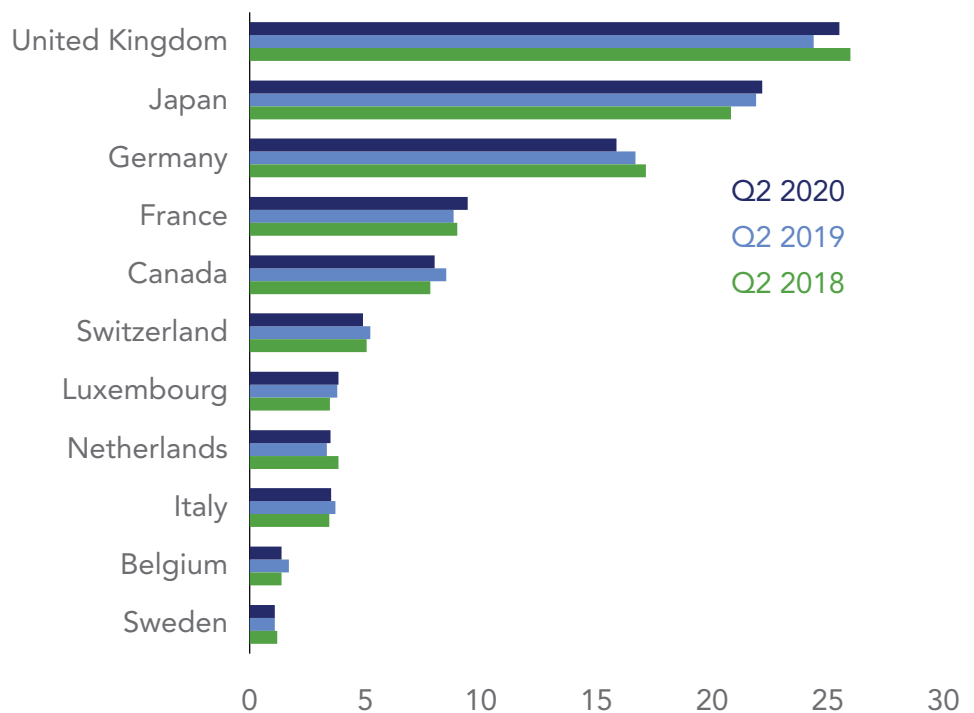
to default.⁹² The index depends on the size of the bank, its leverage, and how connected it is to other financial institutions.

Contagion index values for the U.S. G-SIBs were generally unchanged from 2016 through the end of 2019. In early 2020, as net worth and leverage rose, index values also rose. The index values rose at least 30 percent in the first quarter for 10 of the 36 banks for which the OFR calculates its index. The increases were due mainly to growth in securities lending and over-the-counter (OTC) derivatives liabilities. Some large banks continue to have index values that are more than twice the average of the others due to their size and degree of

connectivity with the rest of the financial system.

Foreign G-SIBs are a potential source of contagion for U.S. banks with cross-border claims on these institutions. As shown in the OFR's Bank Systemic Risk Monitor, some European G-SIBs are large relative to most other G-SIBs. Some of these banks have performed poorly since the 2007-09 crisis. Others have been hit hard by the pandemic. Four of the five largest European G-SIBs reported second quarter 2020 earnings declines ranging between 7 percent and 96 percent. The pandemic raises the risk of a European bank default with potential spillovers to the U.S. banking system. U.S. banks' risk of loss through financial claims on residents of G-10 countries and Luxembourg were steady at 12 to 13 percent of total U.S. commercial banking assets from first quarter 2018 through first quarter 2020 (see **Figure 77**). While the potential for U.S. bank losses is a concern, it is not likely to pose a risk to the stability of the U.S. financial system given regulatory measures and cooperative agreements put in place after the 2007-09 crisis,

Figure 77. U.S. Banks' Financial Claims on G-10 Countries (percent of total for group)



Note: Claims on Luxembourg (not a G-10 country) also shown. Total exposures equal 12-13 percent of total U.S. commercial banking assets in each quarter.

Sources: Federal Deposit Insurance Corporation, Federal Financial Institutions Examination Council, Haver Analytics, Office of Financial Research

which help to prevent cross-border contagion risk.⁹³

Derivatives

Counterparties.

Derivatives trades, whether to hedge risk or to speculate, create interconnections among banks and nonbanks. While hedging can reduce risk to portfolios, the interconnections can increase contagion risk. Leading up to 2008, the lack of funding, capital, and collateral requirements allowed too much risk to be taken by firms with too

little capital and too much reliance on short-term funding.

The credit default swap market, especially CDS on mortgage-backed securities and other asset-backed securities, was a key source of systemic risk then.⁹⁴ This market channeled housing market risk through the financial system. At the time, most swaps were traded bilaterally, or OTC, rather than through an exchange or clearinghouse. The network and its web of risks were unregulated

and opaque. In that crisis, defaults accumulated and dealers failed to maintain market liquidity.

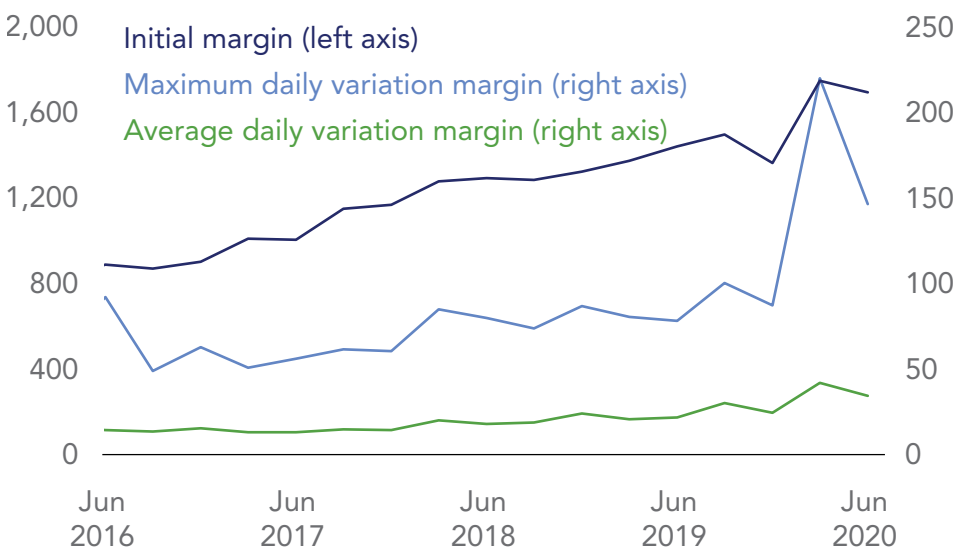
The 2010 Dodd-Frank Act aimed to close regulatory gaps in derivatives markets, including by requiring that certain derivatives be cleared. The Commodity Futures Trading Commission now requires that certain OTC interest rate swaps and index CDS be centrally cleared. That requirement and similar regulations internationally mean central counterparties (CCPs) have become central to swap markets globally by standing between buyers and sellers in order to

manage counterparty risk. Although increased clearing through CCPs has mitigated bilateral counterparty risk, CCPs have become potential sources of systemic risk. In particular they are potential sources of contagion due to overlapping memberships (see *Mapping Interconnections Among Central Counterparties*). To prevent them from acting as sources of instability, CCPs are required to have robust risk-management procedures that protect against the potential failure of one or more members.

Margin provides a buffer to protect a CCP against

loss if a clearing member, or its client, defaults. CCPs manage the risk of default primarily by requiring members to post initial margin payments, plus variation margin payments assessed as market values of positions change. Under the pandemic-induced stress of early 2020, CCPs generally performed well. There were only a few defaults during the extremely volatile days — volatility evident in large daily variation margin payments (see **Figure 78**). These defaults were covered either by the member’s initial margin or, in the case of client defaults, by the responsible clearing member. Initial margins were significantly raised to protect against the repercussions of additional defaults.

Figure 78. Margins Required by CCPs Jumped in Early 2020 (\$ billions)



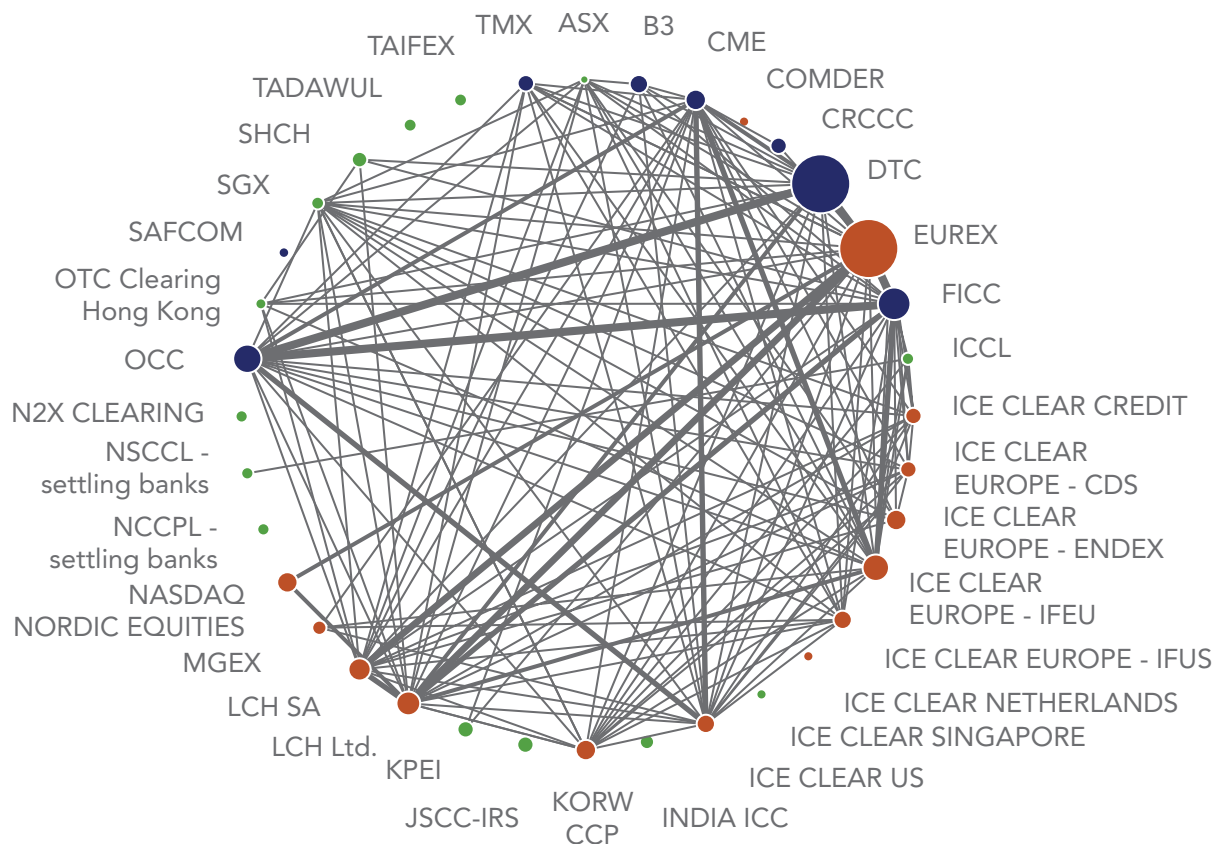
Note: Data as of June 30, 2020. Quarterly aggregate sum of global central counterparty (CCP) margins.

Sources: Clarus CCPView, Office of Financial Research

MAPPING INTERCONNECTIONS AMONG CENTRAL COUNTERPARTIES

As one way to monitor contagion risk, OFR researchers have studied and mapped connections among central counterparties. Even though CCPs have several layers of protection against potential default by one or more members, risks remain. For example, in September 2018 Nasdaq Clearing came close to using all of its prefunded default waterfall resources to cover very large multiday losses by one Norwegian trader, Einar Aas, on his position in electricity futures

Figure 79. Mapping Shows Central Counterparty (CCP) Connections



Note: The thickness of each line represents the number of members each pair of CCPs have in common. The size of each circle represents the number of clearing members a CCP has as of the first quarter of 2020. The color of each circle represents the CCP's location: blue is North and South America, orange is Europe, and green is Asia.

Source: Office of Financial Research

contracts. The losses in excess of initial margin were so large that the CCP's prefunded guarantee resources were substantially depleted.⁹⁵ This incident was a "close call" rather than an example of contagion, and it did not involve a large member. However, the incident highlights the potential risks posed by CCPs in the international financial markets. If a CCP were to default, or the member had defaulted at several CCPs, there could be substantial contagion effects due to interlocking memberships and loss spillovers on members' balance sheets.

Contagion between CCPs can be transmitted through a variety of channels. Suppose that some member M of one CCP defaults because it cannot meet its margin obligations on a particular day. Then the CPP will close out M's positions. Depending on the concentration of M's positions in particular markets, there will be some degree of price impact. This price impact may lead to margin calls by other members of the same CCP as well as members of different CCPs that clear the same markets, which in turn can lead to additional member defaults. Defaults by other members can occur even though the CPP itself does not default.

If the CPP does default, then the usual arrangement is that it haircuts the payments owed to all its members. Thus all members of the CCP are subjected to a negative shock, a second channel that could cause them to default to other CCPs of which they are members. There is a third channel of contagion: if member M defaults at the CPP, then it will typically be declared in default at all the CCPs of which it is a member, due to cross-default agreements.

The more members two CCPs have in common, the more likely it is the two CCPs will suffer a simultaneous default. OFR researchers' maps make such linkages visible (see **Figure 79**). In **Figure 79**, the thickness of each line represents the number of members each pair of CCPs have in common. On this measure, there is an enormous amount of interconnectedness between CCPs across the globe.

CYBERSECURITY RISK

The U.S. financial services sector is at risk of a material cyber incident, one that is significant enough to present systemic risk. In this context, cybersecurity risk is a product of cyber vulnerabilities and threats,

and their potential consequences for the operational resilience of financial firms and the stability of the U.S. financial system.

The use of information technology to execute critical financial processes,

and the interdependencies between firms that result from the connections needed to carry out these processes, introduces significant cyber vulnerabilities. Financial institutions often rely on each other to provide critical operations. The

many links between networks, technologies, and data supporting these operations can create or magnify cyber vulnerabilities, threatening the operations of not just individual institutions, but also the financial system.

At the same time, the U.S. financial system faces cyber threats from a growing range of malicious actors, including criminals, insiders, nation-states, and hackers. Cyber criminals represent pervasive and costly threats, with credit card fraud and account manipulation, for example, costing firms billions of dollars in losses. Insiders, typically employees or contractors, possess access to firms' networks and system privileges. Certain nation-states threaten to disrupt or interfere with the U.S. financial system via cyber attacks, money laundering, and ongoing espionage. In addition, hackers may target the sector to address their ideological grievances and advance a political agenda.

Nonetheless, there have not yet been cyber incidents with severe systemic impacts. However, material cyber incidents may present financial stability

concerns. A cyber incident could compromise the integrity of information technology systems and data that are critical to the stable functioning of financial firms, operations, and the system as a whole. This, in turn, could trigger cascading effects, due to contagion or concentration risks, or a combination thereof. Furthermore, such a situation could lead to a loss of confidence among customers and market participants, resulting in destabilizing asset withdrawals or market sell-offs.

FINANCIAL SERVICES SECTOR USE OF INFORMATION TECHNOLOGY

Despite significant investment in cybersecurity, financial system cyber vulnerabilities persist. If exploited, those vulnerabilities could result in a material cyber incident that may affect the operational resilience of financial institutions or increase systemic risk.

The increasing reliance of financial firms on information technology, particularly across interconnected platforms,

increases the risk that a cybersecurity event will have severe negative consequences. Firms continue to invest in information technology to increase the efficiency of and to enhance and expand their services, including cloud computing to support mobile banking, and artificial intelligence and machine learning to improve fraud detection. However, these technologies can introduce new cyber vulnerabilities into the financial system's critical infrastructure.

Additionally, supply chain dependencies can pose cyber vulnerabilities. In the context of cybersecurity, the supply chain is defined as the global network of information and communications technology suppliers and service providers that financial institutions rely on to support and execute their business operations.⁹⁶ In particular, firms rely on foreign-made computers, network devices, and related equipment, which creates the potential for nation-state actors to influence the financial system supply chain.

CYBER CONTAGION AND CONCENTRATION RISKS

The reliance on an increasingly complex and interconnected information technology infrastructure exposes the financial services sector to contagion and concentration risks. A cyber incident that exploits one or both of these risks could have severe consequences for the entire system.

First, contagion risk results from the cyber vulnerabilities inherent in the connections between firms and across the system. Cyber vulnerabilities may arise from interdependencies, such as the key transactions and processes that financial institutions enable on behalf of one another. Connectedness among firms may give rise not only to credit and liquidity risks, but also to operational risk. Linkages with operational importance include access to the systems that allow for payment, clearing, and settlement systems to operate smoothly. These linkages increase efficiency but may magnify cyber vulnerabilities. For example, a cyber incident that occurs

at a financial institution providing key services for other firms could cause significant operational disruptions to the sector. This issue is particularly acute when participants provide services of systemic importance for significant firms.

Moreover, the financial sector faces cyber risks as a result of dependencies financial institutions have on companies in other sectors.⁹⁷ The financial services sector depends on energy and communications sectors to provide the electricity and Internet connectivity that enable financial processes. Cyber incidents affecting this critical infrastructure could have serious adverse effects on the operations of the U.S. financial system. For example, a cyber incident resulting in an electricity outage in the northeastern United States could affect the U.S. financial hub of New York City.

Critical vendors may pose cyber vulnerabilities to financial institutions as well as to the financial system due to the potential for contagion risk, undermining business continuity and incident recovery capacity. Financial system cyber

vulnerabilities arise from financial institutions' reliance on systems or assets that are owned or operated by third parties from other sectors.⁹⁸ Maintaining confidence in the security practices of these providers is increasingly important to preserving stability and preventing contagion.

Although financial institutions' use of, and dependencies on, third parties allows the financial system to function efficiently and to offer an expansive array of products and services, it also results in a loss of direct control over the cyber risks to which these third parties are subject. In this context, dependency refers to the reliance of a financial institution or market utility on a system, application, or asset. When a third party owns and operates a system, application, or asset on which a financial institution depends, that third party may pose cyber, and more broadly, operational risks to the financial institution. Third-party dependencies involve some degree of a loss of control, as "outsourcing inherently means that the organization depends on

external entities that may not share its approach to resilience and cybersecurity or which may have a different level of security capability.”⁹⁹ A third-party provider may not fully understand the level of dependence that a financial institution, or the sector, has on the vendor’s operations and may not mitigate risks to the level that a financial institution needs.

Further, if enough firms rely on the same third-party service providers or products, either directly or indirectly, that could create a concentration of cyber risk. A single financial institution may use hundreds or thousands of third parties, with varying levels of service criticality, connectivity to firm systems, and access to sensitive firm data. Within this set of third parties, such a financial institution could also depend on another subset of critical vendors, or those third parties that the financial institution deems critical to its business operations, based on the services performed or the products provided. Potential concentration risks may arise when multiple financial institutions rely on the same critical vendors.

For example, most major U.S. financial institutions use cloud computing services. Several large technology-focused firms have been central to the development of cloud computing and the growth of the public cloud market. To achieve the scale necessary to maximize the potential of this technology requires substantial resources. Thus, a small number of cloud computing providers dominate the market, which in turn increases concentration risk. A cyber incident at one provider could negatively affect many financial services sector customers.

The concept of fourth-party risk, which arises through subcontracting by third parties, further complicates the calculation of concentration risk posed by critical vendors.¹⁰⁰ As an example, a third party technology service provider hired by a firm to process data may store those data in a data center; the data center is a third party to the technology service provider, and a fourth party to the financial institution. In such a scenario, if many of the firm’s third-party service providers use the same data center, this data center may pose concentration

risk to the firm — even if the firm does not have any direct contractual relationships with it. More broadly, if enough financial institutions rely on that data center — either directly or indirectly — the data center could pose system-wide concentration risk.

EMERGING QUANTUM COMPUTING RISK

Quantum computing is an emerging technology that has the potential to become a new source of cybersecurity risk. A quantum computer uses the unusual characteristics of quantum mechanics — the nonintuitive behavior of very small particles — to perform computation on an exponentially larger scale than what is possible today.¹⁰¹ Quantum computing could not only increase calculating power, but also change it in ways not currently possible. Today’s encryption keys used to safeguard financial transactions could be cracked within a few hours if the technology were available now. While predictions vary, quantum computers capable of breaking today’s keys are estimated to be about 15 years away.¹⁰²

The exposure of private information contained within financial transactions is a potential threat to financial stability because such exposure could conceivably severely disrupt trust in the financial system. To thwart the threat from this emerging technology, new encryption methods must be standardized and deployed beforehand. Multiple approaches to post-quantum cryptography have been developed through research. The federal government is coordinating its quantum research and development efforts through the Subcommittee on Quantum Information Science within the National Science and Technology Council. Standard protocols for post-quantum cryptography are expected to be drafted and released within the next five years. However, adoption of these new protocols could extend into the mid-2030s or later.

IMPROVING FINANCIAL SYSTEM CYBERSECURITY

Although participants in the financial services sector continue to invest in cybersecurity and improve the resilience of networks and systems, cyber

threats and vulnerabilities continue to grow, both in volume and sophistication. Financial firms are primarily responsible for their own security, but the U.S. government, led by Treasury, works closely with firms on risk mitigation efforts, information sharing, and incident response planning. The better prepared the U.S. government and the private sector are in advance of a cyber incident, the better able the financial services sector will be to weather a material cyber incident and limit its systemic impacts.

ADDITIONAL RISKS

Additional risks to financial stability come from changes to the financial system operating environment. There is uncertainty about the magnitude of the economic and financial consequences and the potential for these changes to be disorderly. We highlight progress and concerns in three areas this year:

- The COVID-19 pandemic adds to concerns about the costs of natural disasters.

- Legacy contracts without appropriate fallback provisions for when LIBOR reference rates cease remain a source of risk for the parties involved.
- The COVID-19 pandemic exacerbates risks associated with the United Kingdom's exit from the European Union.

NATURAL DISASTERS

Natural disasters are a source of uncertainty with potentially large, local or regional humanitarian and economic costs. Naturally occurring events include weather events such as hurricanes, hail storms, and tornadoes; geological events such as earthquakes; floods; and wildfires. In 2017 and 2018, wildfires caused numerous deaths and extensive physical and economic damage especially in California. While 2019 was relatively calm, wildfires were again a major source of economic damage in 2020 and remain an economic threat.¹⁰³

It is argued that extreme weather events could become more common as a result of changes to the global climate during

this century. The potential costs and economic consequences of climate change issues remain a subject of debate among researchers.¹⁰⁴ According to the Financial Stability Board (FSB), 24 financial authorities around the world consider, or plan to consider, climate-related physical or transition risk as part of their financial stability monitoring.¹⁰⁵ Most focus on possible changes in asset prices and credit quality. Some also consider the implications for underwriting, legal, liability, and operational risks. The Bank of England will include “exploratory” climate change scenarios in its 2021 bank stress test tests.

Challenges to quantifying such risks persist, according to the FSB.

The Bank of England’s Prudential Regulation Authority included a climate change scenario in its 2019 insurance stress test. The frequency and cost of natural disasters are of obvious importance to the insurance business, and of course, well recognized by the industry.

One scientist provided this very long-term perspective on natural disasters:

“The earth has suffered mass volcanic explosions, flooding, meteor impacts, mountain building and all manner of abuses greater than anything people could inflict, and it’s still here ... the earth doesn’t care.”¹⁰⁶ Another suggestion is that increased economic costs of natural disasters also reflect “people ... flocking to disaster prone regions.”¹⁰⁷ California seems a good example.

If one would consider the COVID-19 pandemic to be a type of natural disaster, it is one that has had a global impact on economic and financial stability. Few sectors have been spared, although some have profited largely. Most types of insurers have been directly affected, some favorably (health and automobile insurance) and some unfavorably (workers’ compensation insurance, and travel and event insurance).¹⁰⁸ The most important insurance issues are short-term and long-term implications for business interruption insurance coverages. Over the short term, there will be extensive litigation regarding the scope of existing business interruption coverages.

Longer term, the issue is the implementation of an economic support mechanism should another pandemic occur.

There have been suggestions for the adoption of a formal federally backed pandemic support program using an insurance framework, similar to those in use for covering flood and terrorism risks.¹⁰⁹

TRANSITION FROM LIBOR TO ALTERNATIVE REFERENCE RATES

LIBOR, formerly the London Interbank Offered Rate, is a set of globally used reference rates, or benchmarks, that determine interest rates for borrowing in different currencies and for different amounts of time. LIBOR, including U.S. dollar LIBOR, are determined from reports by a panel of banks of their costs of unsecured wholesale borrowing.

LIBOR no longer accurately reflects the marginal borrowing costs of major banks. As the volume of transactions that underpinned LIBOR diminished, regulators, coordinated through the FSB, began a multiyear

transition to reference rates based on observable transactions in active markets. This process accelerated when some banks ceased to report data used to calculate LIBOR.

In the United States, the Alternative Reference Rates Committee chose the Secured Overnight Financing Rate (SOFR) as its recommended alternative to U.S. dollar LIBOR.

The committee includes banks, asset managers, insurers, and industry trade organizations as well as federal and state financial regulators as ex-officio members. In cooperation with the Federal Reserve Bank of New York, the OFR helped to develop, oversee, and ensure a source of data to support SOFR.

The U.K.'s Financial Conduct Authority (FCA) regulates LIBOR. The FCA secured voluntary agreement from banks that are LIBOR panel submitters to continue reporting rates through the end of 2021, but will not compel banks to submit after that time. As a result, after 2021, some LIBOR rates may cease or become non-representative. A LIBOR is non-representative if some, but not all, banks withdraw from

the LIBOR panel, leaving too few submitting banks that are sufficiently active in the relevant markets for the rate to be representative of those markets.¹¹⁰

In June 2020, the FCA announced that it would seek additional powers to manage the wind down of LIBOR. Further, the FCA said that announcements could come as early as this year that some LIBOR would either cease or become non-representative as of the end of 2021, and thus ineligible for use in many contracts after the end of 2021. The FCA is seeking powers to create "synthetic" LIBOR for use in legacy products to help manage the transition to new rates after given LIBOR are declared non-representative. These "synthetic" LIBOR rates could expose U.S. contract parties to legal risk and uncertainty.¹¹¹

There will probably still be contracts that reference LIBOR without adequate fallback provisions after LIBOR publication ends. These financial contracts will expose the parties involved to legal and operational risks. For these contracts, the Alternative Reference

Rates Committee has proposed New York State legislation to modify certain contracts referencing LIBOR and create a "safe harbor" for parties that rely on the recommended benchmark as a fallback be considered.¹¹² This legislation would affect only contracts governed by New York law and its passage is uncertain.

SOFR-linked financial contract volume is growing rapidly, but remains small in comparison to LIBOR-linked volume. There are about \$200 trillion in U.S. dollar LIBOR-linked financial contracts outstanding, which is about 100 times the amount of financial contracts that are SOFR-linked.¹¹³

SOFR is a single overnight reference rate that does not account for variations in credit risk. It also does not reflect a term structure, because it is solely an overnight rate, although averages of SOFR over defined periods can be used. In the view of some market participants, both credit and term structure are needed elements of a reference rate system. Regional banks met with federal banking regulators on Feb. 25, 2020, to discuss

ways to link loan products such as commercial real estate mortgages and commercial and industrial loans to reference rates that include a credit risk component.¹¹⁴ Following up on this meeting, the Federal Reserve Bank of New York has hosted regular Credit Sensitivity Group workshops to address this area.¹¹⁵

Several other alternatives to LIBOR have been discussed. These include Ameribor, Tradeweb/ICE, and others.

U.K. EXIT FROM THE EUROPEAN UNION

The United Kingdom formally left the European Union on Jan. 31, 2020, beginning a transition that is due to end December 31. During the year, the U.K. has essentially continued to be treated as a member while the two sides negotiate the details of the split.

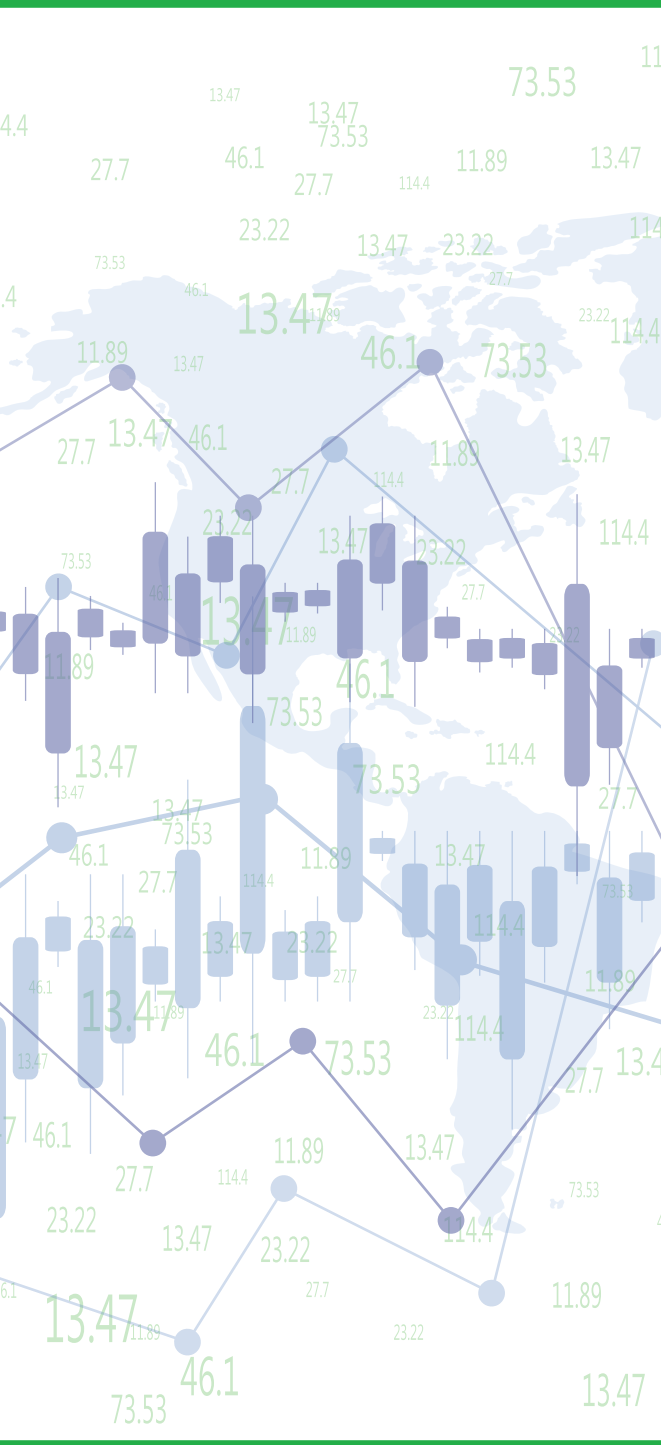
The uncertainty and risks associated with Brexit were highlighted in the OFR *2019 Annual Report*.¹¹⁶ Given the lower priority of Brexit negotiations since the onset of the pandemic, these uncertainties and risks have grown. If the two sides fail to agree to

a trade deal, then U.K.-EU trade will revert to World Trade Organization rules. Lawmakers in the EU and the U.K. have made progress in mitigating the impact Brexit will have on financial markets through several transition concessions, including permission for EU firms to operate in the U.K. until March 2023. Uncertainty remains, though, particularly with respect to the lack of “passporting” between the U.K. and EU. Passporting allows firms from EU nations to sell services across the EU without having to comply with each country’s separate regulations or having to have subsidiaries to conduct business in certain jurisdictions. Lack of passporting threatens established contractual agreements. The United States could be affected because the U.K. would become a third party to EU-U.S. agreements.

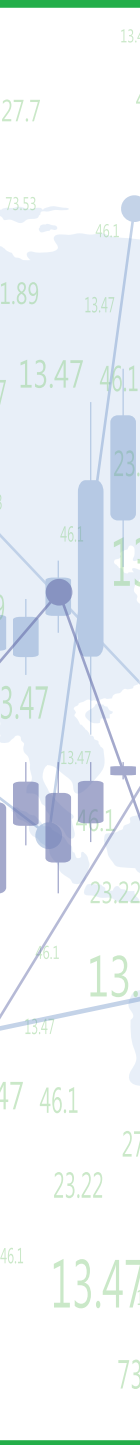
Financial firms have been migrating assets and employees from the U.K. to several EU countries in anticipation of Brexit. The European Securities and Markets Authority in July urged financial market participants to complete

contingency plans assuming the transition period is not extended past December 31.¹¹⁷

The combined shock of the COVID-19 pandemic and an exit without a trade deal could be damaging for the EU, the U.K., and potentially the United States. The shock could manifest in decreased economic output; inefficient financial markets burdened by multiple regulatory frameworks; or reduced movement of people, goods, and services.



PART THREE: EXPLORATION OF INFORMATION MARKETS



PART THREE: EXPLORATION OF INFORMATION MARKETS¹¹⁸

Earlier sections of this report highlight the difficulty for conventional financial stability monitoring to timely and accurately identify true vulnerabilities. Invariably, any such process of identification is prone to finding vulnerabilities that turn out to be immaterial or nonexistent, as well as missing vulnerabilities that are fundamentally difficult to anticipate before the fact, such as those associated with the COVID-19 crisis. On this latter point, for example, no conventional annual stability report flagged the potential for pandemic as a threat to financial stability this year.¹¹⁹

While crystal ball forecasts of systemic vulnerabilities or crises have proven infeasible, financial stability reports remain valuable. They may have potential to become more valuable still by complementing information produced by conventional monitoring

of vulnerabilities (which tends to rely on a naturally limited handful of research and data insights) with insights from people who are most knowledgeable about where and when those vulnerabilities might reveal themselves. A mechanism for doing so might lie with better developed “prediction” or “information” markets, where people who have superior information about answering consequential questions can have relatively strong incentives to share their insights more freely.

Led by a Nobel prize-winning economist, authors of an article in the journal *Science* argued that “such markets can help to produce forecasts of event outcomes with a lower prediction error than conventional forecasting methods.”¹²⁰ Moreover, such markets have been shown capable of producing

more accurate and timely signals of weakening financial stability.¹²¹

Another prominent set of authors from the California Institute of Technology, the University of Pennsylvania’s Wharton School, and Dartmouth College characterized prediction markets as capable of quickly assessing new information, and robust to manipulation.¹²² Prediction markets might do so by leveraging the self-selection of market participants — that is, participants who are better informed about a particular question are more likely to correctly answer the question and thus enjoy a monetary payoff for having done so. And the converse is also true — that is, people with inferior information could participate, but find themselves more often than not losing money, and thus have relatively weak voice in the wisdom of crowds.

This section of our report thus begins with a review of how costly or otherwise hidden information can play a fundamental role in creating systemic risks, and illustrates how a market might economize on those costs. Current approaches to managing systemic risks rely to a considerable extent on regulation, capital requirements, and oversight. People who are charged with enacting these strategies, however, may work at a considerable distance from local knowledge that can help gauge reliance of financiers on each other for funding, the concentration of asset holdings across financiers, and the likelihood that adverse news about one financier's solvency can encourage runs on another's liabilities. Top-down approaches to monitoring and managing systemic risk can thus face tight and hard-to-move constraints against efficiently reducing the possibility, and mitigating the severity, of any such future crisis.

A market for information about the prospects for realizing systemic risks could address such constraints.¹²³ Information markets might also be structured to better

evaluate whether proposed or enacted policies and regulations can reduce systemic risks in a cost-effective manner.¹²⁴ This latter type of market might also help point the way toward less distortionary and more effective stability-related policies and regulations.¹²⁵ And ultimately, mechanisms such as these could be important for the real economy, where reliably expanding opportunity depends in considerable part on a reliably free flow of financial capital.¹²⁶

THE ROOTS OF SYSTEMIC RISK

In 2014, the Committee on Capital Markets Regulation offered a useful taxonomy for examining the roots of systemic risk.¹²⁷ Systemic risk might emerge from any one of the "three C's" — that is, connectedness, correlation, or contagion (see **Figure 80**). For example, Bank A can become "connected" to Bank B through its loans to B. The prospect of B failing prior to repayment, in this case, could increase concerns about A's solvency.

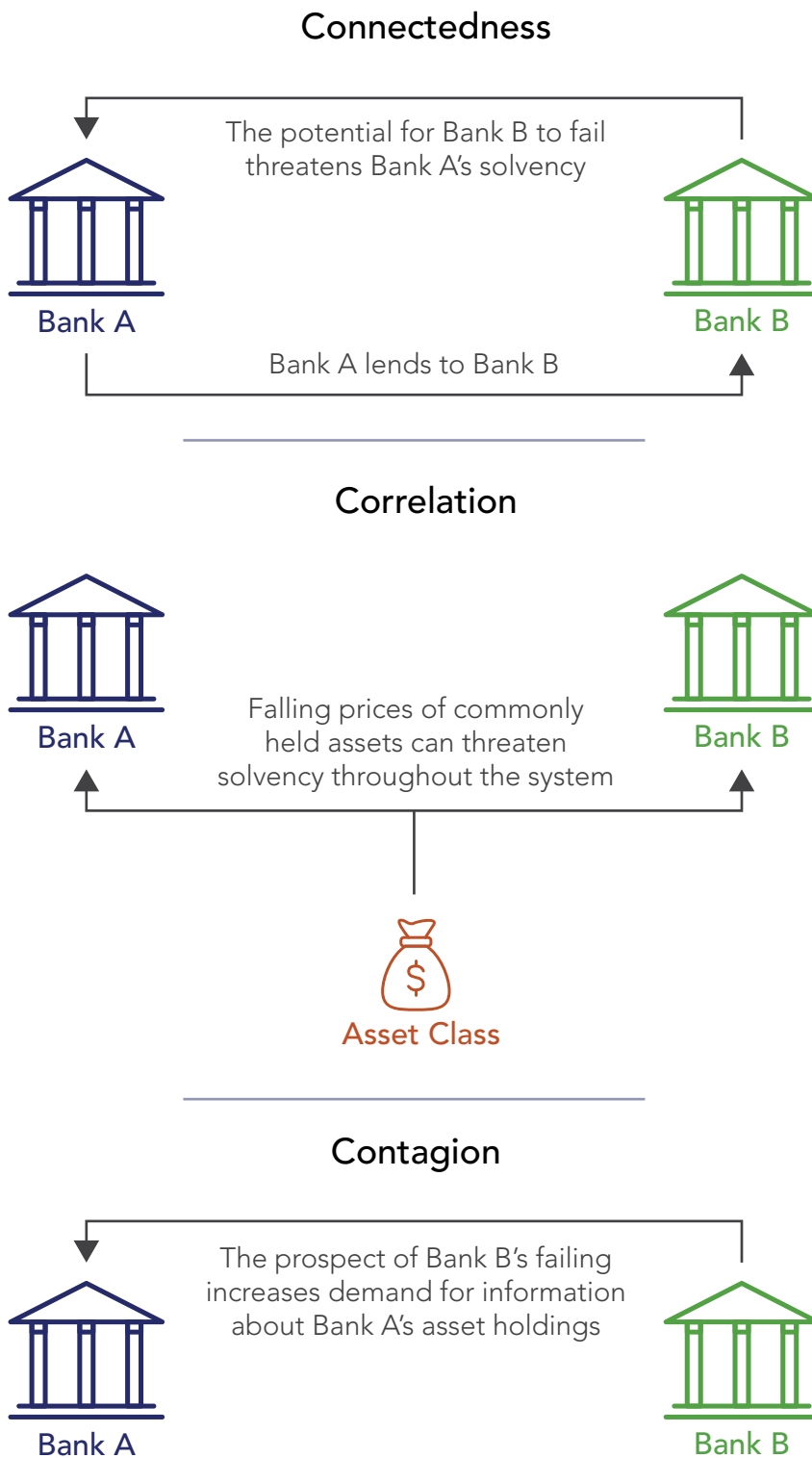
The chance for Banks A and B to fail in close order

might also increase as their asset holdings become more "correlated." If A and B are both heavily invested in housing securities, for example, then their risks of insolvency can increase at the same time with falling housing prices.

Finally, Banks A and B might fail in close order through the dynamics of "contagion." Normally, depositors and other short-term, fixed-claim lenders can rationally remain ignorant about each bank's asset holdings (because they are among the first in a line of claimants to be paid back). The prospect of B failing, however, can increase the sensitivity of A's creditors to information that they would have rationally ignored in normal times. And rather than bear the cost of collecting that information on news of B's difficulties, these creditors may do better by quickly withdrawing their financial support, which in turn could instigate a run on Bank A.

It is important to appreciate how the foundation from which each of the "Three C's" might increase systemic risks shares a common factor — that is, the opportunity cost of becoming fully informed.

Figure 80. The Three C's of Systemic Risk



Source: Office of Financial Research

For example, if information was costless, then Bank A's creditors would know exactly how "connected" their investments are to Bank B's performance, and exactly how healthy B is and will be. And except for transaction costs, the prices at which A could attract financial backing would fully reflect this information at all times, leaving A's creditors indifferent between maintaining and withdrawing their support. Except for information costs in this model, A's creditors would have little incentive to "run" on the prospect of a "connected" bank's difficulty.

Likewise, equipped with full information, creditors of Banks A and B would know exactly how "correlated" their investments are to any particular asset or class, and prices at which those banks could attract capital would fully reflect that information. Investors in both banks would have relatively little reason to run, because doing so in expectation would get them no more than foregoing withdrawals until later.¹²⁸

Finally, "contagion" may find difficulty gaining a toehold without costly information. Normally,

short-term, fixed-claim investors in Banks A and B can rationally maintain ignorance about their banks' asset holdings. In this state of the world, longer term and contingent capital has to lose considerable value before these short-term fixed claims are compromised. The opportunity for such investors to quickly and fully exit in normal times can rationally discourage them from monitoring banks' asset holdings.¹²⁹ In a manner similar to that of the first two "C's," costless information would leave Bank A's claimants indifferent to running on the news that B's chance of insolvency increased. Rather than being a discrete surprise, that prospect would be known and competitively priced at all times.

Seeing through this taxonomy to a necessary condition for systemic risk could help improve management of that risk. Nevertheless, conventional policy approaches to addressing connections between banks or correlations across banks' asset holdings rely on second-hand or more distant information or

on information that can become stale. Policies that address contagion face the same constraint, and the widespread policy of basing capital requirements on asset holdings might even increase risk by encouraging financial organizations to correlate their asset holdings.¹³⁰ All might do better if information about the prospect of realizing systemic risks could be produced at a lower cost.

Competitive markets for information about systemic risk could facilitate this efficiency gain. The late Nobel laureate, Ronald Coase, reminded economists that political and legal institutions are superfluous, except for obstacles to mutually beneficial transactions such as the cost of becoming sufficiently informed about the quality of a product or service. To be sure, Coase's point was not that markets naturally evolve to their competitive ideal. Rather, it was to highlight what human-made organizations must do to create the conditions for Adam Smith's "invisible hand," and thus reliably expand economic opportunity.

Viewed through this Coasean lens, organizational

structures and institutions that reveal who benefits from an exchange of goods or services, facilitate terms for the exchange, and economize on the opportunity costs of enforcing those terms, are necessary for allocative efficiency that expands economic opportunity at any point in time, and for productivity gains that expand economic opportunity across time. To the extent that systemic risks grow from the deep root of costly information, market structures and institutions that economize on those aspects of transaction costs might complement more centralized approaches to strengthening financial stability.

HOW INFORMATION MARKETS MIGHT COMPLEMENT SYSTEMIC RISK MANAGEMENT

Information markets can serve as a platform for trading securities, the payoffs of which refer to whether a particular state-of-the-world is realized on a certain date. Such a security might refer to

an indicator of systemic risk, for example, and promise to pay its owner \$1 if that measure exceeds a particular threshold 90 days into the future. To the extent that market institutions in which that security trades promote pricing efficiency, security prices throughout the contract period could offer a real-time and unbiased estimate of how likely the threshold will be realized on the expiration date. If the security trades at \$0.25 on day 60, for example, then even individuals who are not participating in the market could learn that the specified indicator of systemic risk is expected to have been breached 30 days out with a 25 percent chance.¹³¹

Markets such as these can be efficient, and frequently outperform competing mechanisms such as polls for aggregating otherwise dispersed information.¹³² This empirical efficiency can make sense from a theoretical perspective. Note, for example, that someone who is relatively ignorant about what is necessary for a hypothesized state of the world to actually occur, or the evolution of empirical

conditions for triggering that realization, is likely to systematically lose money in such a market. Traders who buy and sell information market securities based on what they prefer to happen (rather than what they believe will happen) could be similarly disadvantaged. Even if such individuals enter a market, they may have only a weak effect on the price at which a security trades, leaving the best informed and least biased traders to influence prices.

Except for its importance to general economic performance, the potential for widespread failure of financial service firms might well receive less attention than does systemic risk.¹³³ In other words, if downturns in the financial services sector tended to be self-contained, then producers and consumers outside the sector might worry much less about the prospect for systemic crises. The breadth of economic decline associated with 2008's Financial Panic may suggest otherwise, however — that is, the Great Recession and previous financial recessions had a strong impact on a broad distribution of firms and households whose production and

consumption activities might have otherwise appeared independent of how well the financial services sector was performing.

A realization of systemic risk through any of the “three C’s” (connectedness, correlation, or contagion) could imply that the relatively independent performance of financial service organizations in normal times can become much more strongly related. An economic laureate, Myron Scholes, similarly noted that “at times of [financial system] crisis, things that were seemingly unrelated all of a sudden become related.”¹³⁴ A research team (Beville, Falaschetti, and Orlando (2010)) built on observations such as these to consider what an information market for systemic risk might look like, and how it might complement or substitute for various aspects of more centralized approaches to managing that risk. They did so by noting that, while the performance of financially dependent and independent firms might share little correlation during periods of relatively low systemic risk levels, that relationship could

grow in strength under the hypothesis that difficulties in the financial services sector can trigger a broader economic downturn.¹³⁵

In this model, an increase in the correlation between the performance of financially dependent and independent firms might offer information about the prospect of realizing systemic risks, and thus serve as a payoff trigger for information market contracts.¹³⁶ To illustrate how such a contract might work in practice, the same research team (Beville, Falaschetti, and Orlando (2010)) looked to peer reviewed estimates (Rajan and Zingales (1998)) for information about how sensitive firms are in various economic sectors to the efficiency with which financial services are being produced. These estimates suggest that pharmaceutical firms tend to be most reliant on financial service efficiency, and tobacco firms the least. In normal times, we might thus expect the performance of pharmaceutical and tobacco firms to be influenced by largely unrelated forces — for example, weather for tobacco and the pace of discovery for

pharmaceuticals. When prospects for systemic risk are increasing, however, business performance in these two sectors might become more strongly aligned.

Building on these relationships, researchers found that daily stock market returns from what can otherwise appear to be very different types of firms began to exhibit historically strong correlations in the third quarter of 2007, and continued to do so through the first quarter of 2009.¹³⁷ The authors also corroborated this statistical evidence by analyzing texts from financial news, and were unable to dispose of the conclusion that the increased correlation in their data reflects elevated systemic risk per se, and not some unrelated force.

Finally, these researchers detailed how an information market contract that derives from stock price correlations between financially dependent and independent firms might provide an early warning to systemic risk regulators and market participants alike. In particular, they highlighted how prices for information market securities, where payoffs are contingent on

such correlations having reached a particular threshold on a future date, might efficiently predict whether this indicator of systemic risk will indeed be realized. Broad access to those predictions could, in turn, help investors and regulators better monitor channels for financial contagion and reallocate resources according to this information in a more orderly manner than would after-the-fact bank runs. The authors highlighted, for example, that this type of market indicator might have raised red flags well in advance of the Panic of 2008, as the correlation between tobacco and pharmaceutical stocks almost tripled from 0.27 in the middle of 2007 to 0.75 as the Panic played out.

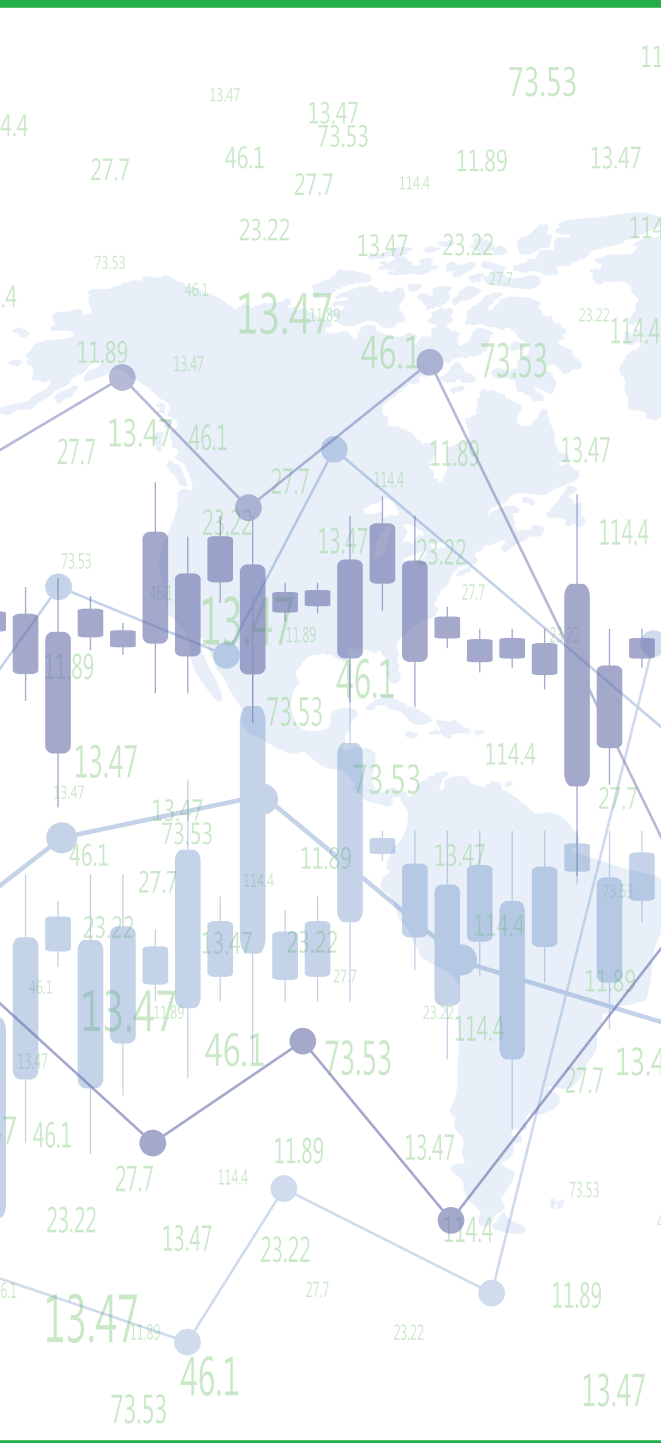
These authors also suggested that, by economizing on the costs of anticipating systemic risks, information markets might facilitate a more suitable allocation of those risks, and thus reduce the chance for systemic crises to emerge while increasing the resilience of financial markets in the event of such a crisis. While addressing how information markets could strengthen

the ability of regulators, counterparties, and third parties alike to improve risk management for a given institutional structure, this research left untouched the question of how information markets might also improve forecasting abilities for the regulatory landscape. Others (Abramowicz (2004)) showed how such a market could also be constructed.¹³⁸

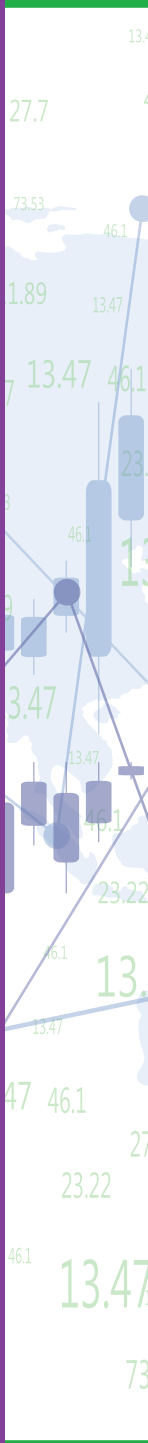
Effectively managing systemic risk is important if financial institutions and markets are to reliably support economic opportunity, while also serving as a moderator of economic fluctuations. Consider, for example, that apps on today's smart phones come with little if any marginal increase in consumer prices, but would have cost almost a million dollars in the 1980s.¹³⁹ Absent a relatively free flow of financial capital, productivity gains that facilitated this remarkably fast and large increase in consumer surplus may not have been possible.¹⁴⁰

Information markets for systemic risk might find an important supporting role here. By discouraging participation from people with weak information or

distributional interests, markets such as these could improve both public and private management of systemic risk by serving as a complement to regulations and oversight institutions.



PART FOUR: THE OFR'S PERFORMANCE



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A YEAR OF MISSION FOCUS

Congress established the OFR principally to support the Financial Stability Oversight Council by providing germane data to FSOC members, developing empirically supported research insights, and advancing data products that can point to financial system vulnerabilities. Adhering to and delivering on our Office's statutory mandate was essential to identifying and assessing those vulnerabilities in a year that saw considerable turbulence threaten financial stability.

A NEW STRATEGIC PLAN

This year also saw the OFR complete its fiscal year (FY) 2020-2024 Strategic Plan. Rooted in the Dodd-Frank Act, with a firm emphasis on our Office's mandate to support the FSOC and its members, our plan allows the OFR to be

flexible and responsive to its stakeholders' changing needs in a disciplined manner as financial markets and business models evolve. Consistent with organizational excellence, the plan fully aligns with the Treasury Department's FY 2018-2022 Strategic Plan.

STEADY PROGRESS

The past year saw OFR make great progress in fully engaging staff members in truly consequential work. OFR colleagues embraced leadership roles in both national and global committees and organizations. They also built vital databases from concept to final products, as well as timely shock-and-stress-indicators, and reliable stability and risk monitors. And furthering its pursuit of organizational excellence, OFR established a culture of accountability and professionalism at every level of our organization, which led to fulfilling improvements in

employee engagement and efficiency.

INTERNATIONAL LEADERSHIP IN CROSS-BORDER FINANCIAL DATA STANDARDS

GREATER ADOPTION OF THE LEGAL ENTITY IDENTIFIER (LEI) BY GOVERNMENTS AND THE PRIVATE SECTOR

The LEI is a data standard for precisely identifying parties to a financial transaction. The OFR continues to play a leadership role in the LEI Regulatory Oversight Committee (ROC). The ROC is an international group of public sector authorities instrumental in establishing the Global LEI System, and acts as a governance body for the Global LEI Foundation. This private, nonprofit entity sets standards for the LEI and

oversees adherence to those standards by companies and organizations that issue LEIs.

Use of the LEI is growing, both in the United States and abroad. With more than 1.7 million LEIs issued as of Sept. 30, 2020, the Global LEI System has already achieved its goal of establishing the preeminent, high-quality entity identifier for nearly every systemically important and globally active financial firm.

The LEI lets government financial authorities quickly and accurately identify counterparties to financial transactions, and in doing so, allows for more accurate and cost-effective analyses of emerging risks to national financial systems, especially where these risks may cross national borders. At the same time, private firms may employ the LEI to better monitor their own risk positions.

The growing use of the LEI over the years has led to its adoption outside of its roots in counterparty risk management and the financial sector. For example, the LEI can reduce costs for banks when they bring on new clients. And because the LEI can

precisely identify parties in transactions, it is also being considered as an element to identify parties involved in cross-border payments and in export-import financing.

The OFR plays an integral role in maintaining ISO 17442, a standard developed by the International Organization for Standardization (ISO) on which the LEI is based. This year, ISO completed a five-year review of ISO 17442 and published an updated version. OFR staff participated in domestic and international working groups that contributed to this review. As members of these working groups, they provided leadership, contributed to the development of documents, and applied subject matter expertise.

IMPROVED LEI DATA QUALITY

The ROC has continued to focus on improving the quality of data that underlie the LEI, including expanding its work on strengthening the standards for Level 2 LEI data and other elements of LEI reference data.

Entities obtaining an LEI submit Level 2 LEI data

regarding their “direct accounting consolidating parent” and the “ultimate accounting consolidating parent” — that is, the ultimate owner of the entity. With access to such data, participants in a transaction can quickly identify the parents of their counterparties, as well as subsidiaries or other entities within an organization, and thus better control their risk.

ESTABLISHMENT OF NEW CROSS-BORDER FINANCIAL DATA STANDARDS

This past year, the ROC took on the role of international governance for three new financial data standards: the Unique Transaction Identifier (UTI), the Unique Product Identifier (UPI), and the Critical Data Elements (CDE), that will facilitate the global aggregation of over-the-counter (OTC) derivatives data. The OFR, as chair of the ROC’s Working Group on Governance of Unique Identifiers and Data Elements (GUIDE), collaborates with the Financial Stability Board’s Working Group on UTI and UPI Governance (FSB GUUG).

The UTI is a new global financial data identifier that uniquely identifies an OTC derivatives financial transaction. A key milestone was achieved this year, with the OFR's input and support, for the FSB GUUG to approve and hand off the UTI to ISO for development of the UTI as an approved ISO standard. With direct input from the OFR in the ISO Working Group, the analysis of the new standard (ISO 23897) was completed, and the UTI is now available for industry use. The UTI will be used in multiple jurisdictions and improves the abilities of firms to monitor their OTC derivatives financial transactions across borders.

The UPI will allow derivatives regulators and other government agencies to better monitor emerging financial risks by categorizing different types of derivatives transactions. A second milestone for the FSB GUUG, with contributions from the OFR, is the initial development of the UPI as an ISO standard. The OFR participated in the ISO Working Group, which expects to deliver two documents from the assessment phase by year-end 2020. Additionally,

the OFR participated in finalizing the technical and governance arrangements with the Association of National Numbering Agencies (ANNA) Derivative Service Bureau (DSB), the Service Provider for the UPI. The ANNA DSB's role is to issue UPIs, as well as manage the UPI repository.

The CDE for OTC derivatives transaction reporting harmonizes how certain data are reported to regulators and trade repositories. This standard has many potential benefits, including the quality of data that regulators, trade repositories, and firms collect about financial transactions. In 2020, the OFR continued its participation in the FSB GUUG's CDE Message Group, where the group completed its analysis of the CDE data. This work was conducted in partnership with the Society for Worldwide Interbank Financial Telecommunication (SWIFT), the Registration Authority for the ISO 20022 standard, with the OFR providing subject matter expertise. The CDE data will be incorporated into the ISO 20022 repository and available for industry use early next year.

Consolidating governance of these new financial data standards under the ROC leverages the ROC's experience in governing the LEI. The OFR will continue working with FSOC members and non-U.S. regulatory authorities to support the ROC's governance of the UTI, UPI, and CDE, while maintaining the ROC's robust oversight of and commitment to the Global LEI System.

DATA PRODUCTS AND INNOVATIONS

The Dodd-Frank Act requires OFR to develop tools for measuring and monitoring financial vulnerabilities and risks. In this fiscal year, those tools included the start of the Office's first data collection, which covers centrally cleared funding transactions in the U.S. repurchase agreement (repo) market (see *U.S. Repo Markets Data Release and the Short-term Funding Monitor*). The OFR addresses its Congressional mandate through this collection and a number of other germane data products, which we review below.

U.S. REPO MARKETS DATA RELEASE AND THE SHORT-TERM FUNDING MONITOR (STFM)

Short-term funding is crucial for price discovery, efficiency, and liquidity in securities markets. Short-term funding markets provide financing, facilitate hedging of risk, monetize liquid assets, serve as a low-risk alternative to deposits for cash investors, and can be used to obtain securities. These critical markets are vulnerable to disruptions, and stresses in short-term funding markets can signal problems in the financial system. To further the OFR's charge to monitor financial stability, the Office established a collection of data on these markets, shared this aggregated data with the public, and constructed a monitor to present these data.

Repurchase Agreements

The repo market is the largest short-term wholesale funding market in the United States. Between \$2 trillion and \$4 trillion of these short-term secured loans are traded every day. In repo markets, financial institutions such as banks, dealers, money market funds, and hedge funds lend and borrow on a short-term basis using a variety of financial instruments as collateral. Most repo transactions are conducted at overnight maturities. Technically, the borrower sells securities to the lender for a price, then very soon thereafter, usually the next day, buys them back at a predetermined higher price. The difference in price from one day to the next is, in substance, the interest paid on the loan of cash, collateralized by securities. Because of the secured and overnight nature of most of the repo market, these interest rates are often used as an overnight risk-free-rate against which other riskier interest rates can be calculated.

Centrally Cleared Repo Data Collection (Cleared Repo)

The OFR collects data on behalf of the FSOC and provides those data to the Council and its members. This year, to enhance the FSOC's ability to identify and monitor potential risks to U.S. financial stability, the OFR established a data collection covering centrally cleared funding transactions in the U.S. repo market. The collection requires daily reporting to the OFR by central counterparty (CCP) clearing houses and marks the first time the OFR has gone directly to industry to collect financial market information on an ongoing basis. Despite the vulnerabilities of short-term funding markets, only a portion of the overall repo market was previously covered by regulatory data collections.

Given the shared uses of collateral and links between the funding and asset markets, the risks of spillover and contagion can ripple through the markets. Anemic data collection could create blind spots that compromise financial stability. The cleared repo collection is an important step in closing this data gap, which can improve regulators' capacity to monitor developments in various segments, identify emerging threats, and support the calculation of certain reference rates, specifically the new preferred benchmark, the Secured Overnight Financing Rate (SOFR).

U.S. Repo Markets Data Release

To improve transparency in repo markets, the OFR leveraged its cleared repo collection with previously available data to create a prototype high-frequency data product covering activity in repo markets. The U.S. Repo Markets Data Release contains daily data on rates and volumes in centrally cleared and tri-party repo markets. These data are broken out by tenor (the maturity of a short-term loan) and underlying collateral. This release is useful for understanding dynamics in repo markets, and provides more detail on overall activity in these markets than any other currently available source.

Short-term Funding Monitor (STFM)

To make the U.S. Repo Markets Data Release easily accessible to users, and to provide broader context, the OFR created the Short-term Funding Monitor to integrate data releases with existing data sets. Through the STFM's market digests, users can access curated views with interpretive text provided by researchers at the OFR. These digests are split into different topics, such as rates, volumes, tenor, and the underlying collateral of a loan. Navigating these views, users can find digests of specific interest. The monitor also provides users deeper insights into how prices move in the repo market. Features include a flexible visualization tool with prepackaged views to allow monitoring of vulnerabilities; aggregated and masked data, free of sensitive disclosures and downloadable for analysis; and data made accessible via an application programming interface (API) for easy ingestion by other platforms. By making data describing short-term funding markets available in a variety of formats — from curated market digests, to individual series, to the ability to download and update data programmatically via the API — the OFR can increase the accessibility and extent of information the public has about short-term funding markets and their crucial role in the economy.

FINANCIAL STRESS INDEX (FSI)

The FSI is a daily index that monitors stress in the financial system. It is constructed from 33 financial market indicators, such as yield spreads, valuation measures, and interest rates, and can be decomposed by region or type of stress. The FSI's timely indicators of financial stress at home and abroad proved invaluable as the markets dropped in the first quarter of 2020, and served as an effective tool for navigating uncertainties throughout the year.

U.S. MONEY MARKET FUND (MMF) MONITOR

The MMF Monitor tracks the investment portfolios of money market funds. In this year's market of dips and spikes, the MMF gave users the critical ability to examine and track individual funds and market trends, as well as connections between money market funds and securities issuers in the United States and internationally. The MMF converts data from the Securities and Exchange Commission's Form N-MFP into a user-friendly format that allows users to chart

fund characteristics such as the types of assets held, investments by country, and counterparties involved.

INTERAGENCY DATA INVENTORY

The Foundations for Evidence-Based Policymaking Act of 2018 requires agency data to be both accessible and capable of supporting statistical evidence, with the objective of informing the making of effective policy. The FSOC Interagency Data Inventory is a catalog of data collections from FSOC members and other government organizations. The inventory does not contain data, but rather metadata — data about data — on each collection. These metadata are publicly available but sometimes difficult to find. The Interagency Data Inventory is updated annually and can be used to search for data collections and analyze gaps and overlaps in data collections. Each FSOC member organization determines which of its data collections to include in the Inventory, which contains a brief description of each data collection, and basic information such as the collecting organization,

the name and number of the form used to collect the data, and the type of collection, such as financial or supervisory.

BANK SYSTEMIC RISK MONITOR (BSRM)

In 2011, the Basel Committee on Banking Supervision, a group of bank supervisors from 28 jurisdictions, created a set of 12 financial indicators to identify global systemically important banks (G-SIBs). A G-SIB is a bank whose failure could pose a threat to the international financial system. A bank identified as a G-SIB must hold more risk-based capital to enhance its resilience and is subject to additional regulatory oversight.

In 2016, the OFR created its G-SIB Scores Interactive Chart. As the needs and requirements of the FSOC and the global financial market expanded, the OFR replaced its G-SIB Scores Interactive Chart with the Bank Systemic Risk Monitor (BSRM) — a collection of key indicators for monitoring systemic risks posed by the largest banks. The BSRM allows users to easily assess a bank's systemic risk capital

surcharge, total assets, leverage, and reliance on short-term wholesale funding. Features include systemic importance scores for international and U.S. banks, and the OFR's Contagion Index, which reflects the exposure of the financial system to the activities and results of these banks.

Components of the score focus on the size of a bank and its broader impact on the financial system based on:

- the extent of the bank's network of obligations within the financial system;
- the unique proposition of its offerings and services not easily replaced by others;
- the complexity of the bank's operations as it pertains to the various asset classes in which it's involved;
- and the coverage it provides across international borders.

Users have access to data tabs, customizable charts, and the OFR's Contagion Index, which considers size, leverage, and relationships with other financial

institutions to reveal the potential loss that could spill over to the rest of the financial system if a given bank were to default.

FINANCIAL INSTRUMENT REFERENCE DATABASE (FIRD)

More than a decade ago, the Dodd-Frank Act established a mandate for OFR to prepare and publish a Financial Instrument Reference Database (FIRD) in a manner easily accessible to the public. The OFR will deliver the first phase of this mandate by year-end 2020.

During the FIRD's initial phase, the OFR is developing a foundational Data Dictionary, leveraging the ISO 20022 financial message standard that is available on a free and open basis. This international data standard covers the bulk of financial instruments and supports the creation of financial messages for communicating buy and sell transactions, and interest and dividend payments. ISO 20022 also contains the granular data elements that form the reference data for financial instruments. For example, a user will be able to go into the Data

Dictionary and look up "interest rate" and easily view and understand how ISO 20022 defines this term.

In 2020, the OFR worked directly with SWIFT to assess the content and structure of the data repository and establish the foundation for the Data Dictionary component of the FIRD. In the initial phase, the Data Dictionary covers five asset classes along with their associated data elements (debt, equity, warrant, option, and future). The OFR is targeting completion of front-end development by the end of 2020.

Future phases will include an expansion of OFR's Data Dictionary to add asset classes and new data elements, such as the ISO 20022 Critical Data Elements for derivatives instruments being finalized by the Financial Stability Board's Group on UTI and UPI Governance and targeted for integration in ISO 20022 in 2021. This expansion aligns with SWIFT's call for global use of ISO 20022 for all financial data reporting and avoids "breaking the chain" to reach full migration.

COLLABORATION

SUPPORT FOR THE FINANCIAL STABILITY OVERSIGHT COUNCIL AND ITS MEMBERS

The OFR supports the FSOC and its members by providing research and analysis to help identify threats to financial stability, fulfilling FSOC requests for research and analysis, and working with FSOC members on research and data projects. As one of the world's foremost experts in setting data standards, the OFR collects, maintains, and shares supervisory and commercial datasets with the FSOC. Our Office also leads the FSOC Data Committee and works with the FSOC Systemic Risk Committee to address data gaps, provide a forum for information sharing among the FSOC's Chief Data Officers and representatives, coordinate action on data-related topics, and oversee the annual update to the Interagency Data Inventory. The OFR's Director serves as a nonvoting member of the FSOC, and the OFR and the FSOC Secretariat work together to ensure proposed research and data topics, projects, and

publications are consistent with the OFR's mission. This year, at the request of the FSOC, the OFR conducted a literature review on the Current Expected Credit Loss (CECL) standard.

FINANCIAL RESEARCH ADVISORY COMMITTEE (FRAC)

The FRAC provides industry, academic, and government expertise to the OFR and informs OFR's work on research and data issues. Its members are experts in business, economics, finance, data science, risk management, and information technology. The committee meets twice each year and is governed according to the Federal Advisory Committee Act. The agenda and minutes are publicly available. In February 2020, the FRAC shared its findings on where the most important capital adequacy issues are in today's financial system and where increased transparency can further financial stability. In July 2020, the Committee discussed the shift to passive (index) investment strategies and recent lessons for financial stability.

FINANCIAL RESEARCH ADVISORY COMMITTEE MEETINGS

Feb. 27, 2020

Department of the Treasury, Washington. The 15th meeting of the FRAC, held in the Cash Room at the main Treasury building, included discussions of capital adequacy and financial transparency.

July 16, 2020

Virtual meeting. The 16th meeting of the FRAC included discussions of passive investing, and basis trades and Treasury market illiquidity.

STANDARDS BODIES AND PUBLIC FORUMS

Participating and taking leadership roles in the initiatives of U.S. and international standards bodies allows the OFR to collaborate with domestic and international counterparts on matters of common interest (see **Figure 81**). Foremost amongst the OFR's domestic counterparts are FSOC members.

Figure 81. Standards Bodies in Which the OFR Participated in 2020

1 Legal Entity Identifier Regulatory Oversight Committee

- 1.1 Executive Committee
 - 1.2 Plenary
 - 1.3 Plenary – Joint ROC-GUUG Small Group
 - 1.4 Committee on Derivative Identifiers and Data Elements
 - 1.5 Committee on Evaluation and Standards – Data Quality Working Group
 - 1.6 Committee on Evaluation and Standards – Level 2 Data Working Group
-

2 Financial Stability Board – Working Groups on Governance

- 2.1 UTI, UPI, and CDE Governance Group
 - 2.2 CDE Message Group
 - 2.3 UPI Technical Analysis Group – Substream 3
-

3 International Organization for Standardization, TC 68 – Subcommittee 8

- 3.1 WG 1 – ISO 10962, Classification of Financial Instruments (CFI) Code
 - 3.2 WG 4 – Revision of ISO 17442, Legal Entity Identifier (LEI)
 - 3.3 WG 5 – ISO 23897, Unique Transaction Identifier (UTI)
 - 3.4 WG 7 – ISO 24366, Natural Persons Identifier (NPI)
 - 3.5 WG 8 – ISO Unique Product Identifier (UPI)
-

4 International Organization for Standardization, TC 68 – Subcommittee 9

- 4.1 WG 1 – ISO 20022 Semantic Models
 - 4.2 SG 1 – Review of ISO 20022 Standards Release Comments
-

5 International Organization for Standardization, TC 68 – Advisory Groups

- 5.1 AG3 – Standards Best Practices
 - 5.2 TAG 1 – Fintech Technical Advisory Group
-

6 Accredited Standards Committee X9, Inc.

- 6.1 Board of Directors and Executive Committee
 - 6.2 X9D Securities Subcommittee – Chair
 - 6.3 X9D Securities Subcommittee – ISO 17442 LEI Mirror Group
 - 6.4 X9D Securities Subcommittee – ISO 24366 NPI Mirror Group
 - 6.5 X9D Securities Subcommittee – ISO 6166 ISIN Mirror Group
 - 6.6 X9D Securities Subcommittee – X9D1 ANSI X9.145 FIGI
 - 6.7 X9D Securities Subcommittee – X9D2 ANSI X9.6 CUSIP
-

Source: Office of Financial Research

International counterparts include financial regulatory authorities, finance ministries, and central banks. Participating and taking leadership roles in the initiatives of these bodies also provides opportunities to collaborate with representatives from the private sector. In addition to participating in the initiatives of standards bodies, the OFR engages in collaborative, open discussions in public forums about standards matters. In June 2020, OFR participated in a panel discussion hosted by the ISITC, a financial services industry group focused on trade-processing standards, on the topic of standards for industry sector classification. The panelists included representatives from the public and private sectors.

CONFERENCES COSPONSORED

On Nov. 21-22, 2019, the OFR joined the Federal Reserve Bank of Cleveland to host their annual financial stability conference in Ohio. The focus was on identifying risks to financial stability and developing appropriate policy tools to enhance the resilience of financial markets and institutions

to future systemic shocks. Topics included the effects of macroprudential and monetary policy on financial stability, regulatory challenges of technological advances on financial markets and financial institutions, and systemic risks and risk mitigants associated with nonbank financial institutions. Participants from industry, regulatory agencies, and academia shared their insights in keynote addresses and panel discussions.

INFORMATION TECHNOLOGY (IT)

CLOUD RESOURCES AND INCREASED CAPABILITIES

As part of a multiyear effort, the Technology Center focused on migrating more IT systems and workloads to cloud computing services. Significant advances included deployment of security, auditing, and authorization control systems. Such systems let the OFR manage and track which data individual users see. The OFR also moved several terabytes of archived data to the cloud, creating significant

cost savings on hardware and software licensing. The OFR will continue migrating to cloud services and reengineering the OFR's telecommunication network.

REMOTE CAPABILITIES

In the first quarter of 2020, a few weeks before moving to 100 percent telework due to the COVID-19 pandemic, the OFR replaced obsolete laptops and deployed a new remote office with collaboration capability. The timing of these efforts, which followed the new strategic plan, proved invaluable after the full-time telework directive, giving 100 percent of the OFR workforce remote access and collaboration capabilities. Employee engagement and productivity proved to be exceptional.

DATA COLLECTION AND MANAGEMENT

The Technology Center led the development of the expanded Bank Systemic Risk Monitor. The center also realigned functions in the Analytic and Data Stewardship roles to enable, develop, and support the daily intake and production of the Short-term Funding

Monitor, ensuring it met the target publication time every day, after completion of the data intake, load, validity, and quality checks. And, in close cooperation with the Data Standards Group, the Technology Center led the development efforts of the first release of the Financial Instrument Reference Database.

DATA AND INFORMATION SECURITY

Data and Information Security continues to be a primary area of focus. Federal agencies are mandated by the Federal Information Security Management Act (FISMA) to understand the security risks posed to their information technology systems, applications, and environment, and are required to take appropriate actions to mitigate these risks. To help agencies evaluate these risks, the National Institute of Standards and Technology (NIST) developed a Security Assessment and Authorization (SA&A) methodology for federal information systems, NIST SP 800-53. The SA&A is a formal methodology for testing and evaluating the security controls of the

system to ensure that it is configured properly to meet the security mandate. A FISMA-compliant SA&A is required for a system, application, or environment to get an Authority to Operate. In FY 2020, the OFR completed its triennial Security Assessment and Authorization.

OFR ORGANIZATION

The OFR's directive to support the FSOC and its members is achieved through leading research, analysis, and risk-monitoring tools, as well as the management of the interagency data inventory, development of financial data standards, and yearly assessments on significant developments in the financial system and potential threats to financial stability.

In 2020, the OFR Director, Dino Falaschetti, completed his first year of a six-year term. In addition to leading the OFR, working closely with the OFR's senior managers, he engages directly with a broad array of stakeholders, including the FSOC and its members, Congress, industry, international entities, and the FRAC.

The Research and Analysis Center conducts applied and essential long-term research and analysis to support the stability of the U.S. financial system. The Center produces financial stability monitors, research and briefings for the FSOC and other stakeholders, and evaluations of financial stability policies to promote best practices in financial risk management. The Research and Analysis Center has two sections, Financial Institutions and Financial Markets, requiring advanced analytical capabilities and intellectual resources to address a wide range of questions related to financial stability, as well as deep subject matter expertise regarding financial markets, financial institutions, and the regulations affecting them.

The Data Center leads and supports global efforts to develop and improve data standards that further efficiencies in reporting and analyzing financial data. The Data Center also develops data products and promotes appropriate data-sharing to meet stakeholder needs. The Data Center has two sections: Data Strategy and Standards, which works to develop, identify,

and promote standards for financial data and data collection; and Data Products, which provides data and related products to stakeholders.

The Technology Center oversees OFR information technology systems and system security, including an IT platform to support analysis with large-scale data sets. The Technology Center also acquires commercial, nonpublic, and proprietary data through procurements, provider agreements, and the OFR's own collection activities. The Technology Center has five sections requiring expert capabilities in many IT fields: Technology Management and Procurement; Information Security; Analytic Systems Support; Enterprise Systems Support; and Data Operations.

The Operations Division provides expertise, implementation, policy, and oversight for a variety of organizational needs: strategy and performance, budgeting, publications, travel, administrative support, human resources, procurement, and facilities. The Operations Division has two sections, Operational Support and Management Support, with responsibility

for OFR operational policies, procedures, and controls. The division works closely with the Treasury Department's Office of the Assistant Secretary for Management.

The Office of the Chief Counsel, which reports directly to the Treasury Department's Office of General Counsel, provides legal guidance on research and analysis, data acquisition and use, policy initiatives, procurements, and agreements with other organizations. The Office of the Chief Counsel also coordinates the OFR's responses to oversight bodies, such as auditors and Congress.

GROWTH MANAGEMENT

The OFR continues to build through recruitment efforts for key positions and skills. Positions filled this year included the Principal Deputy Director of Research, Analysis and Data; Deputy Director for Technology; Associate Director of Data Products; and several Researcher and IT positions. Senior management continuously reviews the organization to ensure critical needs are satisfied. The Office staff

totaled 107 as of Sept. 30, 2020.

The OFR Director is committed to building sound working relationships with employees and supporting team building with an emphasis on public service. As a continued effort to improve the OFR culture and employee engagement, the Director hosted small-group OFR Employee Lunches in the first half of FY 2020 to identify what employees need to succeed and to solicit employee recommendations to further inform the OFR's human capital strategy. The Director's initial priorities included a focus on security in the workplace and management transparency in conducting business. The OFR contracted with the Federal Mediation and Conciliation Service in the second quarter to serve in an ombudsperson capacity. This initiative provides an independent, third-party resource for OFR employees to address any management issues. The Director's priorities also included developing the OFR Workforce Plan 2020-2024, which identifies opportunities to address workforce gaps regarding

employee development, recruitment, and retention. In addition, the Director's priorities included managers reviewing the Federal Employee

Viewpoint Survey results and developing an Office-wide action plan to improve employee engagement and organizational culture. The action plan is updated on an

ongoing basis and progress is shared with all OFR employees.

BUDGET

The OFR obligated \$62.69 million in FY 2020, 42 percent for labor and 58 percent for other expenses (see **Figure 82**). A large portion of the nonlabor figure is due to significant OFR expenses, particularly in the Technology Center (\$23.4 million), which support the OFR's unique mandates.

By statute, the OFR is not funded by annual Congressional appropriations, but rather by semiannual assessments from bank holding companies with total consolidated assets of \$250 billion or more each, a threshold that identifies them as global systemically important banks, and nonbank financial companies supervised by the Board of Governors of the Federal Reserve System.

The OFR pays the Treasury Department nearly \$8 million per year to support the OFR's human resources, budget, travel, and acquisitions activities. In addition, the OFR pays Treasury more than \$5

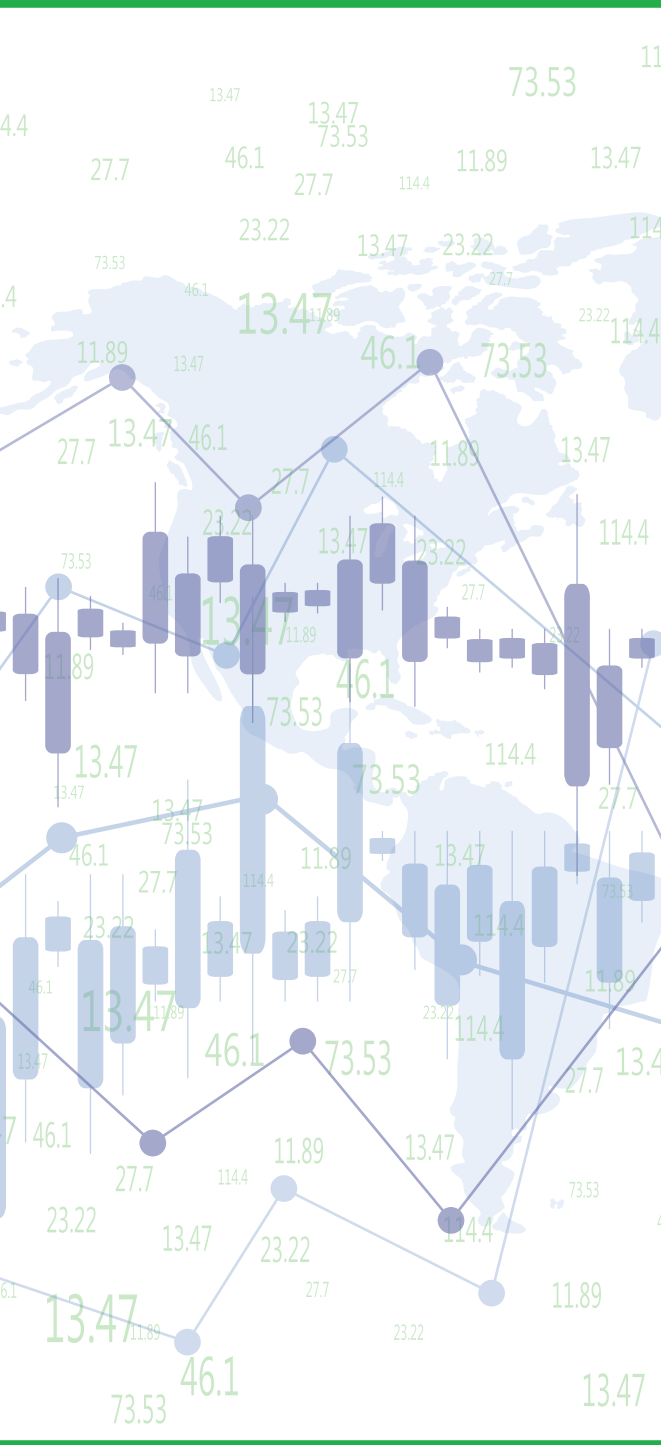
Figure 82. OFR Funds Obligated in Fiscal Years 2015-20 (\$ thousands)

	2015	2016	2017	2018	2019	2020
Compensation	29,036	32,485	37,379	31,991	18,095	19,205
Benefits	9,507	11,322	13,054	10,932	6,860	7,100
Benefits to Former Employees					292	
Labor Total	38,543	43,807	50,433	42,923	25,247	26,305
Travel	453	556	447	147	156	75
Transportation					2	
Communication and Utilities	3,811	62	179	131	68	116
Printing and Reproduction	31	26	22	8	7	7
Other Services	25,033	35,794	31,823	26,353	26,648	25,815
Supplies and Materials	8,060	8,312	6,508	5,649	6,118	9,837
Equipment	8,785	5,997	3,459	679	309	535
Grants		320				
Nonlabor Total	46,173	51,067	42,438	32,967	33,308	36,385
TOTAL	84,716	94,874	92,871	75,890	58,555	62,690

Note: Other services include rent and administrative support for human resources, conferences and events, facilities, and procurement.

Source: Office of Financial Research

million annually for IT circuits, payroll services, and agency-wide systems for training, performance management, and human resources management. The OFR Director must consult with the FSOC Chairperson in establishing the OFR budget and workforce.



GLOSSARY ENDNOTES BIBLIOGRAPHY



GLOSSARY

Accommodation Expansionary monetary policy in which a central bank seeks to lower borrowing costs for businesses and households to make credit more easily available.

Activities-based approach An approach to examining risks to financial stability by examining a diverse range of financial products, activities, and practices.

Adverse selection When sellers have more information than buyers have, or vice versa, about some aspect of product quality. Adverse selection can impose higher risk on the less-informed party.

Agency mortgage-backed securities Securities made up of mortgages purchased by housing finance agencies Fannie Mae, Freddie Mac, and Farmer Mac, or guaranteed by housing finance agency Ginnie Mae. The agencies set underwriting requirements for the loans they will purchase or guarantee.

Alternative Reference Rates Committee (ARRC) A committee that includes banks, asset managers, insurers, and industry trade organizations as well as federal and state financial regulators as ex-officio members; the committee chose the Secured Overnight Financing Rate (SOFR) as its recommended alternative to U.S. dollar LIBOR.

Aruoba-Diebold-Scotti Business Conditions Index Index designed by Federal Reserve Bank of Philadelphia researchers to track real business conditions at high frequency by using a mix of economic and financial indicators.

Asymmetric information When one party to a transaction has greater material knowledge than the other party.

Attestation In an attestation engagement, a certified public accountant is engaged to issue or does issue an examination, review, or agreed-upon procedures report on subject matter, or an assertion about the subject matter that is the responsibility of another party. Under the Sarbanes-Oxley Act of 2002, independent auditors attest to and report on public company managers' assessments of internal controls over their companies' financial reporting.

Auditor opinion Statements auditors include in their reports on company finances. Auditors issue adverse opinions when they have concerns that the statements have not been prepared along accepted principles or that the data supporting the statements have been misrepresented. They issue clean opinions when they find no significant exceptions to accepted accounting practices and disclosure requirements. Auditors issue opinions with an explanation for various reasons, including when they want to call out something that might be material.

Authorized participant A liquidity provider to an exchange-traded fund. When there is a shortage of exchange-traded fund shares in the market, the authorized participant creates more shares. When there is an excess supply of shares, the participant redeems shares to reduce the number of shares on the market.

Bagehot's Dictum Theory of Walter Bagehot, a 19th century writer and banker, who proposed central banks should lend freely and often against good collateral and at high interest rates to quell a financial panic.

Bail-in The approach to a failed or near-failed entity in which its creditors write down their

claims to make the entity solvent, as opposed to the provision of government support.

Bank for International Settlements (BIS) An international financial organization that serves central banks in their pursuit of monetary and financial stability, helps to foster international cooperation, and acts as a bank for central banks.

Bank holding company (BHC) Any company that has direct or indirect control of one or more banks and is regulated and supervised by the Federal Reserve under the Bank Holding Company Act of 1956. BHCs may also own nonbanking subsidiaries such as broker-dealers and asset managers.

Basel Committee on Banking Supervision (BCBS) An international forum for bank supervisors that aims to improve banking supervision worldwide. The BCBS develops guidelines and supervisory standards, such as standards on capital adequacy, the core principles for effective banking supervision, and recommendations for cross-border banking supervision.

Basel III A comprehensive set of global regulatory standards to strengthen the regulation, supervision, and risk management of the banking sector. The measures include bank and banking system regulation to strengthen firms' capital, liquidity, risk management, and public disclosures to reduce the banking system's vulnerability to shocks.

Blockchain Common name for cryptographic distributed ledger technology used to record online transactions. Blockchains are the basis of cryptocurrencies.

Bond duration The measure of a bond's market price sensitivity to interest rate changes, measured in years. Price risk rises as duration increases.

Brexit An abbreviation for "British exit," the departure of the United Kingdom from the European Union.

Brokered deposit A government-insured deposit that a bank obtains through a brokerage. These funds may leave the bank quickly when a competitor offers a higher rate.

Business development company (BDC) Type of closed-end fund that primarily invests in small or developing companies. BDCs are often publicly traded companies and are regulated by the Securities and Exchange Commission.

The Three C's Connectedness, correlation, and contagion – three key sources of systemic risk.

Call report A quarterly report of a bank's financial condition and income that all federally insured U.S. depository institutions must file.

Capital The difference between a firm's assets and its liabilities, capital represents the net worth of the firm or the firm's book equity value to investors.

Capital conservation buffer Additional capital banks are required to hold outside periods of financial stress, meant to be drawn down during times of stress. This buffer is intended to prevent breaches of minimum required capital ratios.

Capital requirement The amount of capital a regulator requires a bank to have to act as a cushion to absorb unanticipated losses and declines in asset values that could otherwise cause a bank to fail.

CARES Act The Coronavirus Aid, Relief, and Economic Security Act of 2020, stimulus legislation to buffer the consequences of the COVID-19 pandemic and related economic shutdowns.

Central clearing A settlement system in which securities or derivatives of a specific type are cleared by one entity that guarantees the trades, such as a clearinghouse or central counterparty. Central clearing is an alternative to bilateral or

over-the-counter trading (see over-the-counter derivatives).

Central counterparty (CCP) An entity that interposes itself between counterparties to contracts traded in one or more financial markets. A CCP becomes the buyer to every seller and the seller to every buyer to help ensure the performance of open contracts.

Charge-off rate (for banks) Realized loan losses as a percent of total loans. The net charge-off rate subtracts recoveries on written-down debt from gross charge-offs.

Circuit breakers A market regulatory mechanism to stop trading in the public markets when prices of certain instruments drop more than a predefined amount.

Clearing A system that transfers ownership of securities when they are traded and makes related payments.

Clearing bank A commercial bank that facilitates payment and settlement of financial transactions, such as check clearing or matching trades between the sellers and buyers of securities and other financial instruments or contracts.

Clearing member A member of, or a direct participant in, a central counterparty that is entitled to enter into a transaction with the CCP.

Coasean lens A perspective of contemporary British economist and Nobel laureate Ronald Coase that deemphasized oversight and regulation in favor of rewarding accessible information in competitive markets to reveal systemic risk and create opportunity.

Collateral Any asset pledged by a borrower to guarantee payment of a debt.

Collateralized debt obligation (CDO) Securities that hold a pool of debt and are sold to investors in tranches with varying levels of risk. Leading up to the 2007-09 financial crisis, many CDOs consisted of repooled residential mortgage-backed securities (RMBS).

Collateralized loan obligation (CLO) Securities that hold pools of corporate loans and are sold to investors in tranches with varying levels of risk.

Commercial mortgage-backed securities (CMBS) Securities collateralized by commercial mortgages.

Commercial paper Short-term (maturity of up to 270 days), unsecured corporate debt.

Commercial Paper Funding Facility (CPFF) A Federal Reserve facility that finances commercial paper issuance.

Committee on Capital Markets Regulation An independent research organization created in 2006 and focused on policy reforms to develop efficient and stable capital markets.

Committee on Payments and Market Infrastructures (CPMI) A standing committee of the Bank for International Settlements. Representatives are senior officials of member central banks. The CPMI promotes safety and efficiency of payment, clearing, settlement, and related activities, and it serves as a global standard-setting body in this area.

Comprehensive Capital Analysis and Review (CCAR) The Federal Reserve's annual exercise to ensure that the largest U.S. bank holding companies have robust, forward-looking capital planning processes that account for their unique risks and sufficient capital for times of financial and economic stress. The CCAR exercise also evaluates the banks' individual plans to make capital distributions such as dividend payments or stock repurchases.

Concentration risk Any single exposure or group of exposures to the same risk with the potential to produce losses large enough to threaten a financial institution's ability to maintain its core operations.

Conditional Value-at-Risk (CoVaR) CoVaR indicates an institution's contribution to systemic risk, calculated as the difference between value-

at-risk (VaR) of the financial system when the firm is under distress and the VaR of the system when the firm is in its regular, median state.

Contingent convertible (CoCo) bonds

Hybrid capital securities structured as debt but that absorb losses in accordance with their contractual terms when the capital of the issuing bank falls below a certain level. Due to their loss-absorbing capacity, CoCos can be used to satisfy regulatory capital requirements.

Council of Economic Advisers (CEA) An agency within the Executive Office that advises the President of the United States on economic policy.

Countercyclical capital buffer A component of Basel III requiring banks to build capital buffers during favorable economic periods. The buffers can be used to absorb losses in unfavorable periods.

Counterparty risk The risk that the party on the other side of a contract, trade, or investment will default.

Covenant-lite loans Loans that do not include or include weak versions of typical covenants to protect lenders, such as requiring the borrower to deliver annual reports or restricting loan-to-value ratios.

COVID-19 A highly contagious respiratory illness caused by a coronavirus and declared a pandemic in 2020 by the World Health Organization.

Credit default swap (CDS) A bilateral contract protecting the buyer against the risk of default by a borrower. The buyer of CDS protection makes periodic payments to the seller and, in return, receives a payoff if the borrower defaults. The protection buyer does not need to own the loan covered by the CDS.

Credit default swap spread The premium paid by the buyer of credit default swap protection to the seller.

Credit gap A metric in which the ratio of debt-to-gross domestic product (GDP) is measured against its statistically estimated long-run trend.

Credit rating agency Private company that assesses the creditworthiness of a borrower or a financial instrument.

Credit risk The risk that a borrower may default on its obligations.

Credit Risk Transfer (CRT) bonds CRT bonds allow Fannie Mae, Freddie Mac, and sometimes reinsurance companies, to transfer mortgage credit risk to private investors.

Cryptocurrency Digital financial assets (cryptoassets) based on blockchain cryptographic technology. Bitcoin is the most widely used cryptocurrency.

Current expected credit loss (CECL)

Accounting framework for creating reserves for credit losses. Requires firms applying U.S. Generally Accepted Accounting Principles to hold credit loss allowances equal to expected credit losses for the lifetime of certain assets.

Cybersecurity risk The vulnerability of information technology and computer systems to unauthorized access. Innovations such as quantum computing may increase the ability of nefarious players to access encrypted data.

Cybersecurity Assessment Tool A tool designed to complement the National Institute of Standards and Technology's Cybersecurity Framework. The Federal Financial Institutions Examination Council developed the tool to help financial institutions identify and address cybersecurity risks and determine their level of cybersecurity maturity in addressing those risks.

Dash to cash A simultaneous move by participants in money and capital markets to raise cash by selling assets, including Treasuries, and to withdraw from investment funds, creating volatility and price drops.

Debt securitization The aggregating of debt instruments into a pool backing the creation of one or more securities.

Default waterfall The financial safeguards available to a central counterparty to cover losses arising from the default of one or more clearing members.

Defensive draws A strategy by borrowers to draw down their credit lines to raise cash in advance of need.

Defined-benefit pension plan A plan where members' pension benefits are determined by formula, usually tied to years of service and earnings during service, regardless of the assets in the plan. This contrasts with a defined-contribution plan such as a 401-K, where benefits are determined by returns on a portfolio of investments.

Depository institution A financial institution, such as a bank or credit union, that has liabilities in the form of deposits.

Depository Trust & Clearing Corporation

A company that processes and clears trades as the central clearing house for the U.S. capital markets and repository for the derivatives market.

Derivative A financial contract whose value is derived from the performance of underlying assets or market factors such as interest rates, currency exchange rates, or commodity, credit, and equity prices. Derivatives transactions include structured debt obligations, swaps, futures, options, caps, floors, collars, and forwards.

Derivatives counterparties Parties to a derivatives transaction, either trading with each other bilaterally (over the counter) or via a central counterparty.

Discount window The Federal Reserve's traditional facility for making collateralized loans to depository institutions.

Disruption A sudden decline in market prices due to a shock that upends the expected behavior of the financial system.

Distress Insurance Premium (DIP) A systemic risk indicator that measures the hypothetical contribution a financial institution would make to an insurance premium that would protect the whole financial system from distress.

Distress ratio The portion of high-yield debt at face value trading at distressed levels.

Distributed ledger technology See **blockchain**.

Dodd-Frank Act Short name for the Dodd-Frank Wall Street Reform and Consumer Protection Act of 2010. The objective of the Act is to promote financial stability.

Dodd-Frank Act Stress Test (DFAST) Annual large bank stress tests required by the Dodd-Frank Act. A 2018 law change means banks with assets less than \$100 billion no longer go through DFAST.

Duration risk The risk associated with the sensitivity of the prices of bonds and other fixed-income securities to changes in the level of interest rates.

Economic Growth, Regulatory Relief and Consumer Protection Act of 2018 Law that adjusted some provisions of the Dodd-Frank Act, as well as instituting tax law changes.

Emerging markets Developing countries where investments are often associated with both higher yields and higher risks.

European Central Bank's (ECB) Public Sector Purchase Program (PSPP) A process by which the ECB (or "Eurosystem") buys assets, including sovereign bonds, to help maintain stability in various countries.

The European Securities and Markets Authority The European Union's securities market regulator.

Eurozone or euro area A group of 19 European Union countries that have adopted the euro as their currency.

Exchange-traded fund (ETF) An investment fund whose shares are traded on an exchange. Because ETFs are exchange-traded products, their shares are continuously priced, unlike mutual funds, which offer only end-of-day pricing. ETFs are often designed to track an index or a portfolio of assets.

Fallen angel Bond downgraded from investment grade to non-investment grade.

Federal Deposit Insurance Corporation Improvement Act of 1991 (FDICIA) A law that requires federal banking agencies to take action when an insured depository institution's capital declines below a predefined level, and in the case of bank failures, enact a resolution that is the least burdensome to taxpayers.

Federal Financial Institutions Examination Council (FFIEC) An interagency body that prescribes uniform principles, standards, and report forms for the federal examination of financial institutions. The FFIEC makes recommendations to promote uniformity in banking supervision.

Federal funds (fed funds) Overnight interbank borrowing of reserves at the Federal Reserve.

Federal funds rate Interest rate at which depository institutions lend fed funds to each other.

Federal Home Loan Banks (FHLBs) Eleven U.S. government-sponsored banks that provide funding for member financial institutions, mostly through advances secured by mortgages.

Federal Housing Finance Agency (FHFA) Agency responsible for supervision, regulation, and housing mission oversight of Fannie Mae, Freddie Mac and the Federal Home Loan Bank System; it is also the conservator of Fannie Mae and Freddie Mac.

Federal Open Market Committee (FOMC) Twelve-member body within the Federal Reserve System that sets national monetary policy, including setting the target range for the federal funds rate.

Federal Reserve's emergency section 13(3) A section of the Federal Reserve Act that allows emergency lending from the Federal Reserve to financial institutions and others in "unusual and exigent circumstances" with the approval of the Secretary of the Treasury.

Feedback loop (negative) The downward price pressure created when parties meet margin payment obligations on some securities by liquidating positions in other related securities.

Financial contagion When financial or economic shocks initially affect only a few financial market participants and then spread to other parts of the financial system and countries. The risk of contagion increases with the number and complexity of interconnections.

Financial crisis A significant, sustained drop in asset prices, income streams, credit, and liquidity, resulting from an event that shocks the financial system, usually triggering government interventions and bailouts.

Financial market utility (FMU) As defined by the Dodd-Frank Act, "any person that manages or operates a multilateral system for the purpose of transferring, clearing, or settling payments, securities, or other financial transactions among financial institutions or between financial institutions and the person."

Financial stability The condition in which the financial system can provide its basic functions, even under stress. Those basic functions are (1) credit allocation and leverage, (2) maturity transformation, (3) risk transfer, (4) price discovery, (5) liquidity provision, and (6) facilitation of payments.

Financial Stability Board (FSB) An international coordinating body that monitors financial system developments on behalf of the Group of 20 (G-20) nations. The FSB was established in 2009 and is the successor to the Financial Stability Forum.

Financial Stability Oversight Council (FSOC)

A government body created by the Dodd-Frank Act, consisting of the heads of all federal financial regulatory agencies and others, with a statutory mandate to identify risks and respond to emerging threats to financial stability. Chaired by the Secretary of the U.S. Treasury, the Council consists of 10 voting members and five non-voting members, including the OFR Director.

Fintech Financial technology, usually referring to firms that operate on technology-based business models.

Fire sale The disorderly liquidation of assets to meet margin requirements or other urgent cash needs, which can drive prices below their fundamental value. The quantities sold are large relative to the typical volume of transactions.

Fiscal policy Use of government spending and taxes to influence the economy.

Forbearance (debt forbearance) An agreement between borrowers and lenders, or a government mandate, to suspend payments temporarily without being considered in default. Under the CARES Act, mortgage servicers were required to grant payment forbearance, for 180 days, to borrowers experiencing financial hardship and who had mortgages backed by the government.

Foreign and International Monetary

Authorities (FIMA) Repo Facility Allows foreign central banks and international monetary authorities with which the Federal Reserve doesn't have swap agreements to borrow dollars against Treasury securities.

Form N-MFP A monthly disclosure of portfolio holdings submitted by money market funds to

the Securities and Exchange Commission, which makes the information publicly available. SEC Rule 30b1-7 established the technical and legal details of N-MFP filings.

Form PF A periodic report of portfolio holdings, leverage, and risk management submitted by hedge funds, private equity funds, and related entities. The report is filed with the Securities and Exchange Commission and the Commodity Futures Trading Commission, which keep the information confidential. The Dodd-Frank Act mandated the reporting to help the FSOC monitor financial stability risks.

Funding gap The difference between rate-sensitive assets and liabilities. One measure of the funding gap ratio is liabilities due in one year minus liquid assets, divided by total assets.

Funding liquidity The availability of credit to finance the purchase of financial assets.

Generally Accepted Accounting Principles

(GAAP) Accounting rules published in the United States by the Financial Accounting Standards Board.

Global systemically important banks

(G-SIBs) Banks annually identified by the Basel Committee on Banking Supervision as having the potential to disrupt international financial markets. The designations are based on banks' size, interconnectedness, complexity, dominance in certain businesses, and global scope.

Global systemically important insurers (G-SIIs)

Insurance companies annually identified by the Financial Stability Board for having the potential to disrupt international financial markets because of their size, market position, and global interconnectedness.

Government-sponsored enterprise (GSE)

A financial service entity created by the federal government and perceived as being implicitly guaranteed by the government. The GSEs include Fannie Mae, Freddie Mac, Sallie Mae,

Farmer Mac, the Federal Home Loan Banks, the Farm Credit System, and the National Veteran Business Development Corporation.

Gross notional exposure (GNE) A measure of total portfolio leverage, for example in a hedge fund. GNE is calculated as the summed absolute values of long and short notional positions, including both securities and derivatives.

Hactivist Someone who infiltrates computer systems and networks to promote a social or political agenda.

Haircut The discount at which an asset is valued when pledged as collateral. For example, a \$1 million bond with a 5 percent haircut would collateralize a \$950,000 loan.

Hedge fund A pooled investment vehicle available to accredited investors such as wealthy individuals, banks, insurance companies, and trusts. Hedge funds can charge a performance fee on unrealized gains, borrow more than half of their net asset value, short sell assets they expect to fall in value, and trade complex derivative instruments that cannot be traded by mutual funds (see qualified hedge fund).

Hedging An investment strategy to offset the risk of a potential change in the value of assets, liabilities, or services. An example of hedging is buying an offsetting futures position in a stock, interest rate, or foreign currency.

High-frequency trading The use of computerized securities trading platforms to make large numbers of transactions at high speeds.

High-quality liquid assets (HQLA) Assets such as central bank reserves and government bonds that can be quickly and easily converted to cash even during a stress period. U.S. banking regulators require large banks to hold HQLA to comply with the Liquidity Coverage Ratio.

High-yield debt Bonds and other financial instruments rated below investment grade that

pay a higher interest rate than investment-grade securities because of the perceived credit risk; also known as non-investment grade or speculative.

Incurred-loss accounting framework An accounting framework for firms in which loan loss allowances are equal to the losses related to recognized credit impairments. Compare CECL.

Initial margin A percentage of the total market value of securities an investor must deposit up front to purchase securities with borrowed funds.

Intraday credit An allowance by banks for customers to borrow money or overdraw accounts during a single day, at no charge, as long as it is repaid by the close of business that same day.

Institutional loans When referring to the leveraged loan market, term loans originated by bank syndicates and sold to institutional investors.

Interest coverage ratio A calculation of earnings divided by interest expense. Interest expenses that are equal to or greater than earnings before interest and taxes (EBIT) or earnings before interest, taxes, depreciation, and amortization (EBITDA) are unsustainable.

Interest rate swap A swap in which two parties exchange interest rate cash flows, typically between a fixed rate and a floating rate (see swap).

Intermediation Any financial service in which a third party or intermediary matches lenders and investors with entrepreneurs and other borrowers in need of capital. Often, investors and borrowers do not have precisely matching needs and the intermediary's capital is put at risk to transform the credit risk and maturity of the liabilities to meet the needs of investors.

International Monetary Fund (IMF) An international organization that provides credit to developing nations and those in economic distress, typically conditional on economic and financial reforms.

International Organization of Securities Commissions (IOSCO) IOSCO is the international body for securities regulators, and is the recognized standard setting organization for the securities industry. IOSCO works closely with the G-20 forum of nations and the Financial Stability Board on global financial regulatory reforms.

Intervention Action taken by the government to regulate or provide financing to unstable financial markets or institutions.

Inverted yield curve When yields on long-term bonds are lower than those on short-term bonds, the yield curve is said to be inverted. An inverted yield curve is seen as a sign of a possible recession.

Investment-grade debt Securities that credit rating agencies determine carry less credit risk. Non-investment grade securities, also called speculative-grade or high-yield debt, have lower ratings and a greater risk of default.

Legal Entity Identifier (LEI) A unique 20-digit alphanumeric code to identify each legal entity within a company that participates in global financial markets.

Leverage Leverage is created when an entity enters into borrowings, derivatives, or other transactions resulting in investment exposures that exceed equity capital.

Leverage ratios (banks, insurance companies, hedge funds) For banks, the leverage ratio is the Tier 1 (highest quality) capital of a bank divided by its total assets plus its total exposures to derivatives, securities financing transactions, and off-balance-sheet exposures. For insurance companies, the leverage ratio is

assets to policyholder surplus. For hedge funds, the leverage ratio is gross asset value divided by net asset value.

Leveraged loan Broadly, leveraged loans are loans to companies with non-investment grade (below BBB) ratings. Often, a leveraged loan is a loan for which the obligor's post-financing leverage, as measured by debt-to-assets, debt-to-equity, cash flow-to-total debt, or other such standards unique to particular industries, significantly exceeds industry norms. Leveraged borrowers typically have a diminished ability to adjust to unexpected events and changes in business conditions because of their higher ratio of total liabilities to capital.

LIBOR Formerly known as the London Interbank Offered Rates, estimates of the interest rates at which banks can borrow from other banks in London wholesale markets, as measured by a daily survey. LIBOR is still a widely used reference rate system, but is being phased out under regulatory direction.

Liquidity A market is liquid when buyers and sellers can easily trade financial instruments in customary volumes without a material impact on price.

Liquidity Coverage Ratio A Basel III standard that requires large banks maintain enough high-quality liquid assets to meet anticipated liquidity needs for a 30-day stress period.

Liquidity risk The risk that a firm will not be able to meet its current and future cash flow and collateral needs even if it has positive net worth.

Liquidity transformation Funding illiquid assets with liquid and demandable liabilities.

Living wills Resolution plans required of U.S. banks with \$50 billion or more in total consolidated assets and nonbank financial companies designated by the FSOC for supervision by the Federal Reserve. Each living

will must describe how the company could be resolved in a rapid, orderly way in the event of failure.

LTV (loan-to-value) ratio The amount of a loan as a percent of the estimated value of the asset serving as the loan's collateral.

Lockdown Stay-at-home orders from a government to its citizens.

Macroeconomic risk Risk from changes in the macroeconomy or macroeconomic policy.

Macroprudential policy Government policy promoting the stability of the financial system as a whole, in contrast to policy focused on individual markets or institutions.

Macroprudential supervision Supervision to promote the stability of the financial system as a whole. See **microprudential supervision**.

Main Street Lending Program Lending facilities created in 2020 to support small and medium-size businesses and non-profit organizations and their employees. These facilities include the Main Street New Loan Facility, the Main Street Expanded Loan Facility, the Main Street Priority Loan Facility, the Nonprofit New Loan Facility, and the Nonprofit Expanded Loan Facility.

Margin call A requirement by a creditor that a borrower increase the collateral pledged against a loan in response to reductions in the collateral's value.

Margin requirement Rules governing the necessary collateral for a derivative, loan, or related security intended to cover, in whole or in part, the credit risk one party poses to another.

Mark to market Accounting for the value of an asset at its current market price rather than in other ways, such as historical cost.

Market discipline The idea that markets can rein in risk through individual participants behaving in their own interest. This should result in markets pricing risk effectively and curbing excessive risk-taking. See **moral hazard**.

Market liquidity The ability of market participants to sell large positions with limited price impact and low transaction costs.

Market-making The process in which an individual or firm stands ready to buy and sell a particular stock, security, or other asset on a regular and continuous basis at a publicly quoted bid-ask prices. Market-makers usually hold inventories of the securities in which they make markets. Market-making helps to keep financial markets efficient.

Market risk The risk that an asset's price will change and at unexpected magnitudes.

Maturity transformation Funding long-term assets with short-term liabilities. This practice creates a maturity mismatch that can pose risks when short-term funding markets are constrained.

Metadata Data about data. Metadata include information about the structure, format, or organization of other data.

Metadata catalog An organized way to present metadata for discovery, exploration, and use of the related data.

Microprudential supervision Supervision of the activities of a bank, financial firm, or other components of a financial system. See **macroprudential supervision**.

Monetary policy Government or central bank use of interest rates and money supply or asset purchases to affect the economy.

Money market fund A fund that typically invests in short-term government securities, certificates of deposit, commercial paper, or other highly liquid and low-risk securities.

Money Market Mutual Fund Liquidity Facility

(MMLF) A facility established in 2020 to allow the Federal Reserve Bank of Boston to provide loans to eligible financial institutions to purchase assets from certain types of money market funds.

Moral hazard When people do not guard against risk because they expect someone else to pay for the losses arising from that risk.

Mortgage call report A quarterly report of mortgage activity and company information created by state regulators and administered electronically through the Nationwide Mortgage Licensing System & Registry (NMLS).

Municipal Liquidity Facility (MLF) A program created in 2020 to allow the Federal Reserve to buy short-term debt issued by state and local governments with loss protection provided by the U.S. Treasury.

Multilateral organizations Organizations formed by multiple countries to address international problems. Examples include the World Bank and the International Monetary Fund.

Mutual fund A pooled investment vehicle that can invest in stocks, bonds, money market instruments, other securities, or cash, and sell its own shares to the public; regulated by the SEC.

Narrow spread A small difference between buyers' and sellers' prices (the bid-ask) in a liquid market.

National Association of Insurance

Commissioners (NAIC) An organization that represents U.S. state insurance regulators. Through the NAIC, regulators establish accreditation standards and practices, conduct peer review, and coordinate their regulatory oversights of insurance companies.

National Institute of Standards and

Technology (NIST) Cybersecurity Framework Voluntary guidance, based on existing

standards, guidelines, and practices, for critical infrastructure organizations to better manage and reduce cybersecurity risk. The framework focuses on using business drivers to guide cybersecurity activities and considering cybersecurity risks as part of an organization's risk management process.

Nationally Recognized Statistical Rating Organization (NRSRO) Credit rating agency registered with and regulated by the SEC.

Net asset value (NAV) The value of an entity's assets minus its liabilities per share. For example, a mutual fund calculates its NAV daily by dividing the fund's net value by the number of outstanding shares.

Network model A model consisting of a set of nodes, or financial institutions, and a set of payment obligations linking them, to show how financial interconnections can amplify market movements.

Non-investment grade debt Instruments rated below investment grade that pay a higher interest rate than investment-grade securities because of the perceived greater credit risk; also known as speculative or high-yield debt.

Nonprofit New Loan Facility; Nonprofit Expanded Loan Facility Facilities created by the Federal Reserve in the summer of 2020 to lend money to nonprofit organizations.

Notional derivatives exposure The reference amount from which contractual payments will be calculated on a derivatives contract; generally not an amount at risk.

Off-balance-sheet Assets or entities that are not recorded on a company's balance sheet. Rather, they are explained only in notes to financial statements.

Off-the-run Treasury securities Treasury securities outstanding in the market that precede the most recent issue, usually traded less frequently than on-the-run securities.

On-the-run Treasury securities The most recently issued Treasury securities. These are often traded more frequently than their off-the-run predecessors.

Operational risk The risk of loss from internal control inadequacies or failures — problems of lapses by people, processes, or systems — or from external events.

Option A financial contract granting the holder the right, but not the obligation, to engage in a future transaction on an underlying security or real asset. For example, an equity call option provides the right, but not the obligation, for a fixed period to buy a block of shares at a fixed price. A put option provides the right, but not the obligation, to sell an asset for a fixed period at a fixed price.

Orderly liquidation authority (OLA) Provision in the Dodd-Frank Act that allows the Federal Deposit Insurance Corporation to unwind a large, complex company. An OLA serves as a backup to bankruptcy court proceedings.

Originate To extend credit after processing a loan application. Banks, for example, originate mortgage loans and either hold them or sell them to other financial market participants. The distribution can include a direct sale or a securitization.

Over-the-counter (OTC) derivatives Derivatives contracts negotiated privately between two parties, rather than traded on a formal securities exchange. Unlike standard exchange-traded products, OTC derivatives can be tailored to fit specific needs, such as the effect of a foreign exchange rate or commodity price over a given period.

Overnight Indexed Swap (OIS) An interest rate swap in which a fixed-rate price index is swapped against the overnight reference rate.

Own Risk and Solvency Assessment (ORSA) An internal process undertaken by an insurer or

insurance group to assess the adequacy of its risk management and current and prospective solvency positions under normal and severe stress scenarios.

Pandemic A disease or illness that affects a significant portion of the globe.

Passporting Legal arrangement that allows firms from European Union nations to sell their services across the Union without having to comply with each country's separate regulations.

Pension Benefit Guaranty Corporation (PBGC) Agency that insures pension benefits; it has two programs, one for single-employer pension plans and one for multiemployer plans, to pay benefits to retirees in private, defined-benefit pension plans when sponsors cannot pay.

Pension funded ratio The ratio of a pension plan's assets to the present value of its obligations.

Pension Obligation Bonds (POBs) Taxable municipal securities issued by state or local governments to borrow to meet pension obligations.

Paycheck Protection Program Liquidity Facility (PPPLF) A program for the Federal Reserve to extend credit to lenders participating in the Small Business Administration's Paycheck Protection Program, which provides potentially forgivable loans to small businesses to fund their payrolls.

Pension risk transfer The transfer of pension risk from a pension plan to another party, usually through insurance or annuity contracts, longevity swaps, or other contractual arrangements.

Pipeline risk The risk that loans being accumulated for sale cannot be sold at the expected prices or at all.

Price discovery The process of determining the prices of assets in the marketplace through the interactions of buyers and sellers.

Primary Credit Rate The interest rate the Federal Reserve charges banks for discount window borrowings.

Primary dealer Banks and securities broker-dealers designated by the Federal Reserve Bank of New York (FRBNY) to serve as trading counterparties when it carries out U.S. monetary policy. Among other things, primary dealers are required to participate in all auctions of U.S. government debt and to make markets for the FRBNY when it transacts on behalf of its foreign official account holders. A primary dealer buys government securities directly and can sell them to other market participants.

Primary Dealer Credit Facility (PDCF) A facility for the Federal Reserve Bank of New York to make collateralized loans to primary dealers, which are the banks and securities broker-dealers designated to serve as trading counterparties in carrying out U.S. monetary policy.

Primary Market Corporate Credit Facility (PMCCF) A Federal Reserve facility to provide credit to, and purchase new bonds from, large investment-grade corporations.

Prime broker Companies that provide hedge funds and other investors with services such as lending cash and securities.

Qualifying hedge fund Hedge fund advised by a large hedge fund adviser and with a net asset value of at least \$500 million. Large hedge fund advisers are advisers that have at least \$1.5 billion in hedge fund assets under management.

Real estate investment trust (REIT) Corporations that invest in income-producing real estate and pay most of their taxable income to shareholders as dividends.

Regulation SCI A regulation adopted by the Securities and Exchange Commission that applies to entities that directly support six key securities market functions: (1) trading, (2) clearance and settlement, (3) order routing, (4) market data, (5) market regulation, and (6) market surveillance.

Reinsurance The risk management practice of insurers to transfer some of their policy risk to other insurers. A second insurer, for example, could assume the portion of liability in return for a proportional amount of the premium income.

Repo Short form of repurchase agreement.

Repurchase agreement (repo) A transaction in which one party sells a security to another party and agrees to repurchase it at a certain date in the future at an agreed price. Banks often do this on an overnight basis. A repo is similar to a collateralized loan.

Reserve requirements The funds banks are required to hold on deposit with the Federal Reserve.

Residential mortgage-backed securities (RMBS) A security that is collateralized by a pool of residential mortgage loans and makes payments derived from the interest and principal payments on the underlying mortgage loans.

Resilience Ability of the financial system or parts of the system to absorb shocks and continue to provide basic functions.

Resolution plans Plans required of U.S. banks with \$50 billion or more in total consolidated assets and nonbank financial companies designated by the Financial Stability Oversight Council for supervision by the Federal Reserve. Each plan, or living will, must describe how the company could be resolved in a rapid, orderly way in the event of failure. See living wills.

Risk assets Assets that carry risk of default. Such assets include loans, bonds, commodities, and other investment vehicles. U.S. Treasury securities are generally considered free of default risk.

Risk management The business and regulatory practice of identifying and measuring risks and developing strategies and procedures to limit them. Categories of risk include credit, market, liquidity, operations, model, and regulatory.

Risk retention When issuers of asset-backed securities must retain at least part of the credit risk of the assets collateralizing the securities. The regulation also prohibits a securitizer from directly or indirectly hedging the credit risk.

Risk spreads The difference in yields of riskier assets versus perceived safer assets such as Treasuries and bank deposits.

Risk-based capital Amount of capital a financial institution holds to protect against losses based on the risk weighting of different asset categories.

Risk-weighted assets Bank assets or off-balance-sheet exposures weighted according to risk categories. This asset measure is used to determine a bank's regulatory risk-based capital requirements.

Runnable funding Funds that can be withdrawn from a financial institution on short notice. Uninsured bank deposits, shares of money market funds, wholesale borrowings, commercial paper, and repurchase agreements are among runnable sources of funding.

Run risk The risk that investors lose confidence in a market participant because of concerns about solvency or related issues and respond by pulling back their funding or demanding more margin or collateral.

Sarbanes-Oxley Act of 2002 Law aimed at curbing corporate fraud exposed in several financial scandals, including those at Enron

and WorldCom. The law laid out numerous accounting and accountability requirements for companies, managers, and accountants.

Search for yield (reach for yield) Accepting greater risks in hopes of earning higher returns when interest rates on high-quality investments are low.

Secondary Market Corporate Credit Facility (SMCCF) A Federal Reserve facility to support trading of outstanding corporate bonds and corporate bond exchange-traded funds.

Section 13(3) authority A section of the Federal Reserve Act that allows emergency lending from the Federal Reserve to financial institutions and others in "unusual and exigent circumstances" with the approval of the Secretary of the Treasury.

Secured Overnight Financing Rate (SOFR) Interest rate benchmark used as an alternative to LIBOR to set rates on financial products. The SOFR, which is based on repurchase agreement (repo) rates, reflects the general cost of large bank borrowing that is backed by Treasury securities as collateral. The OFR's repo data collection supports the production of the SOFR.

Securities lending/borrowing The temporary transfer of securities from one party to another for a specified fee and time period in exchange for collateral in the form of cash or securities.

Securities Information Processors (SIPs) Established by Congress and the SEC, the SIPs link the activities of U.S. markets into a single data feed.

Securitization A financial transaction in which assets such as mortgage loans are pooled, securities representing interests in the pool are issued, and proceeds from the underlying pooled assets are used to service and repay the securities.

Settlement The process of transferring securities and settling by book entry according

to a set of exchange rules. Some settlement systems can include institutional arrangements for confirmation, clearance, and settlement of securities trades and safekeeping of securities.

Shadow banking Credit intermediation performed by nonbank companies or financed by runnable liabilities without a government guarantee.

Shock A sudden change in fundamental economic drivers and expectations that can stress the economy and financial system.

Single-name CDS A credit default swap where the underlying instrument is tied to one specific issuer or entity.

Skin in the game When originators of loans or other risky instruments keep at least part of the risk for themselves.

Spread The difference in yields between private debt instruments and government securities of comparable maturity.

SRISK A systemic risk indicator based on the capital that a firm is expected to need if there is another financial crisis; short for “systemic risk.”

Stable net asset value A characteristic of some money market funds in which the value of a single share remains the same, usually \$1, even when the value of the underlying assets shifts.

Stablecoin Variety of cryptocurrency that seeks to maintain a fixed value backed by reserves.

Standing facilities Operations to execute monetary policies of the Federal Reserve and European Central Banks.

Stimulus A fiscal or monetary policy to increase the cash flow in circulation and boost the economy.

Stress test An exercise that shocks asset prices by a prespecified amount, sometimes along with other financial and economic variables, to estimate the effect on financial institutions or

markets. Under the Dodd-Frank Act, banking regulators run annual stress tests of the largest U.S. bank holding companies.

Subcommittee on Quantum Information Science within the National Science and Technology Council (SCQIS) The SCQIS coordinates federal research and development in quantum information science and related technologies under the auspices of the executive branch’s National Science and Technology Council’s Committee on Science.

Supplementary leverage ratio Under Basel III, the ratio of a bank’s Tier 1 (high-quality) capital to its total leverage exposure, which includes all on-balance-sheet assets and many off-balance-sheet exposures.

Swap An exchange of cash flows agreed by two parties with defined terms over a fixed period.

Swap Data Repository (SDR) A central recordkeeping facility that collects and maintains a database of swap transaction terms, conditions, and other information. In some countries, SDRs are referred to as trade repositories.

Swap execution facility A trading platform market participants use to execute and trade swaps by accepting bids and offers made by other participants.

Society for Worldwide Interbank Financial Telecommunications (SWIFT) Provides messaging services and interface software between wholesale financial institutions. SWIFT is organized as a cooperative owned by its members.

Syndicated loans Financing provided by a group of lenders.

Systemic risk Risk to systemwide financial stability.

Systemic risk indicators Measures of the risks financial firms may pose to the financial system.

Tail risk The perceived low-probability risk of an extreme event or outcome.

TED spread The difference between three-month U.S. dollar LIBOR and Treasury bill rates.

Ten-year, 10-year forward rate The interest rate investors expect to receive on 10-year Treasury securities in 10 years.

Term Asset-Backed Securities Loan Facility (TALF) A Federal Reserve facility to finance asset-backed securities, such as securitized equipment leases, as well as credit card, auto, and other loans.

Tier 1 Capital Ratio and Common Equity Tier 1 Capital Ratio Two measurements comparing a bank's capital to its risk-weighted assets to show its ability to absorb unexpected losses. Tier 1 capital includes common stock, preferred stock, and retained earnings. Common Equity Tier 1 capital excludes preferred stock.

"Too Big To Fail" (TBTF) The belief that the biggest financial firms will always be bailed out by the government if necessary. In 1984, the Comptroller of the Currency stated that the 11 largest banks could not be allowed to fail.

Total Loss-absorbing Capacity (TLAC) A mix of long-term debt and equity that global systemically important bank holding companies are required to have to absorb losses and implement an orderly resolution without resorting to taxpayer-funded bailouts or extraordinary government measures.

Tranche A portion of a securitized asset pool. From the French word meaning "slice."

Triparty repo A repurchase agreement in which a third party, such as a clearing bank, acts as an intermediary for the exchange of cash and collateral between two counterparties. In addition to providing operational services to participants, agents in the U.S. triparty repo market extend intraday credit to facilitate settlement of triparty repos.

U.S. dollar swap line arrangements Standing facilities with the Federal Reserve that allow key central banks to exchange domestic currency for U.S. dollars to satisfy dollar liquidity demand in their own markets.

Value-at-Risk (VaR) A tool for market risk management that measures the risk of loss of a portfolio. The VaR projects the maximum expected loss for a given time horizon and probability. For example, the VaR over 10 days and with 99 percent certainty measures the most one would expect to lose over a 10-day period, 99 percent of the time. The problem is the other one percent, see tail risk.

Variable annuity A tax-deferred insurance company contract where the owner can choose investment options whose values fluctuate with the underlying securities, much like mutual funds. Variable annuities may also include guarantees of minimum payments, which may exceed the value of the investment accounts.

Variation margin Payment made by clearing members to the clearinghouse based on price movements of the contracts these members hold. See initial margin.

VIX Chicago Board Option Exchange (CBOE) Volatility Index, a measure of 30-day expected volatility in the U.S. stock market.

Volcker Rule Provision of Dodd-Frank Act that limits proprietary trading by commercial banks and their affiliates.

Vulnerabilities Underlying weaknesses that can render the financial system susceptible to instability.

Warehouse loans A line of credit with a bank for nonbank lenders to use mortgages being accumulated for sale as collateral.

Weekly Economic Index A Federal Reserve index of 10 daily and weekly economic indicators. It reflects what annualized percent change in gross domestic product would be if conditions persisted for a quarter.

Wholesale funding Bank funding provided by federal funds borrowing, repurchase agreements, foreign deposits, brokered deposits, and other short-term borrowing. Wholesale funding is considered less stable than funding provided by core deposits.

Work from home (WFH) Historically an unconventional alternative to working in corporate office space. As a result of COVID-19 and various lockdowns, WFH increased in 2020. WFH is possibly a long-term trend with significant implications for commercial real estate, telecommunications, and other sectors.

Yield curve Graphical representation of the relationship between bond yields and their respective maturities. Generally, the curve slants up because longer-term bonds have higher yields than short-term debt securities. When that relationship does not hold, the yield curve is said to be inverted or flat.

Zero lower bound Previously, zero was said to be the lowest interest rate possible, constraining options for monetary policy. Negative interest rates are now common internationally, though not in the United States.

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